

The Iron Age

A Review of the Hardware, Iron and Metal Trades.

Published every Thursday Morning by DAVID WILLIAMS, No. 83 Reade Street, New York. Entered at the Post Office, New York, as Second-Class Matter.

Vol. XXV: No. 21.

New York, Thursday, May 20, 1880.

\$4.50 a Year, Including Postage.
Single Copies, Ten Cents.

The Hudson River Tunnel.

After numerous and vexatious delays during the last few years, owing to litigation and other causes, the great project of tunneling the Hudson River is being energetically and rapidly pushed forward. We

necessity, for safety sake, of keeping the crown of the tunnel at least 20 feet below the river bed, and the considerable depth of the Hudson, 60 feet at some points, have called for quite a considerable grade of the tunnel. For a distance of approximately 2400 feet from the New Jersey shore line, the grade is 2 feet per 100 feet, then it falls to 6 inches, and when approaching the New York side rises to 3 feet. The approaches on both sides will be made probably at an easy grade. It was at first proposed to make one large double-track tunnel, but this plan has been now abandoned, and two single-track tunnels are to be built. Experience at Detroit and at other places where subaqueous tunnels have been built, has taught that while the latter plan offers many valuable advantages, the cost of construction is not materially, if at all, enhanced. One of the pair is now being actively pushed forward, while it is expected that the

on the New Jersey side. A shaft located 83 feet from the shore line, and protected by a bulkhead, as shown in Fig. 1, was first sunk to a depth of 60 feet; its sump, which goes a little deeper than the tunnel line, just entering the layer of sand. The inside diameter of the shaft is 30 feet. It was sunk in the usual manner, and is lined with masonry, in cement, which tapers from 4 feet at the bottom to 2½ feet at the top. It is guarded against an influx of water from below by an arched layer of cement 2 feet 6 inches in thickness at the center and from 3 to 3 feet 9 inches at the sides. In the center rises a 12-inch stand pipe which performs some important functions. While it is directly used for furnishing the supply of water in the tunnel for mixing the cement and working the silt, the pumping of water from the stand pipe has the effect, at the same time, to relieve the pressure on the bottom of the shaft and also at the bottom of the temporary work, until the final con-

foundations for bridges, &c. It has never until now been used for subaqueous tunneling, for which purpose, judging from the admirable results obtained until now, it will conquer a leading place. It is of course impossible to predict at the present juncture how well it will be able to meet with the aid of compressed air the difficulties presented by more dangerous ground, like quicksand or other strata permeated by water under greater head. As we have already stated, the material through which the Hudson River Tunnel is now passing is, fortunately for that enterprise, by no means of a character to tax the system adopted in a severe degree, but there is every reason to believe that with its aid the present tunnel can be built at an expense considerably below that generally accepted as a minimum for such an undertaking. While the column of compressed air thus virtually takes the place of the cumbersome and inconvenient shields or other contrivances in securing the

astonishing in this concentration of work to those who have had occasion to watch the long distances intervening between the different stages of work in the different sections of an ordinary tunnel.

Concerning the details of the work, the following data, for which we are chiefly indebted to Messrs. Brush and Andersen, may prove of interest. At about one-half the depth of the shaft is an air-lock made of boiler iron 6 feet in diameter by 15 feet in length, and provided with heavy gates at either end, which can be hermetically closed. This air-lock forms the ordinary ante-chamber necessary to effect communication between the outer air and the tunnel. Passing through the air-lock, a temporary entrance, shown in Fig. 1, leads to the tunnel proper. The compressed air is furnished at present by a Clayton compressor having 10-inch steam cylinders and 10-inch air cylinders, with a 13-inch stroke, a second compressor of very recent construction being

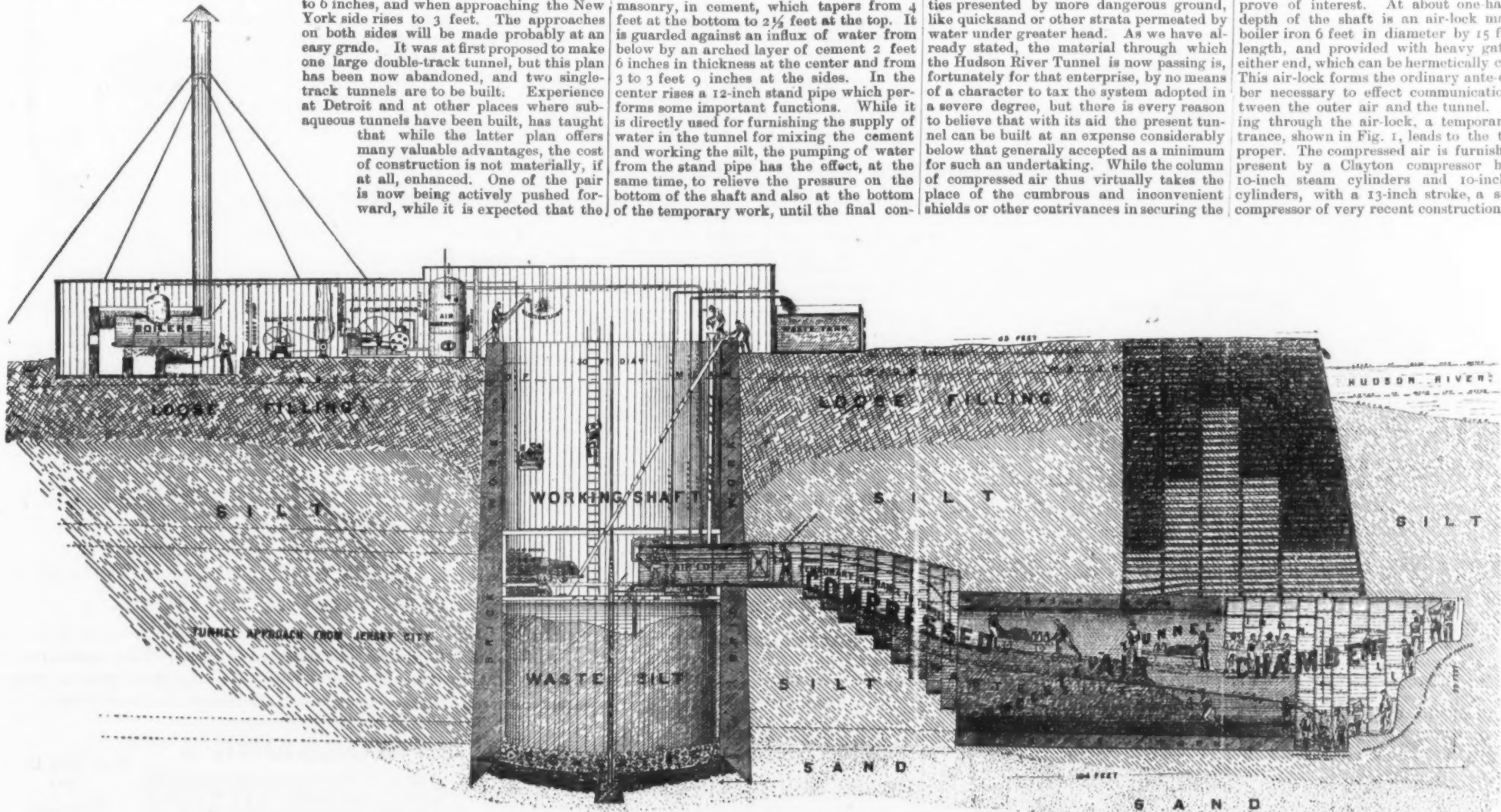


Fig. 1.—Section of the Workings of the Hudson River Tunnel.

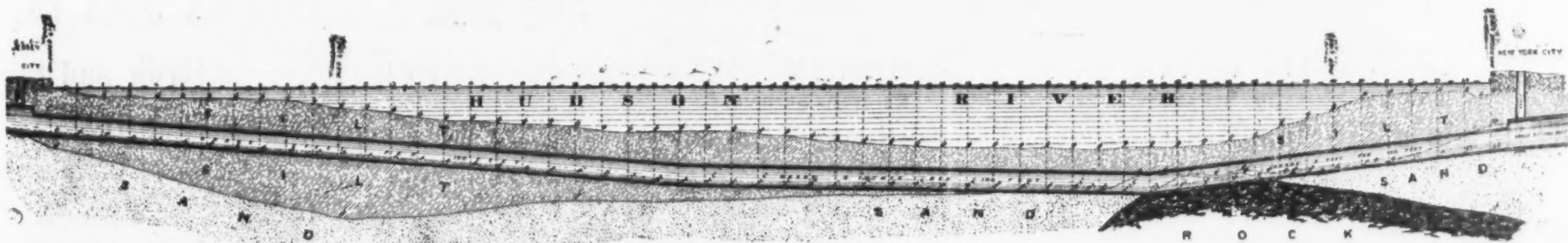
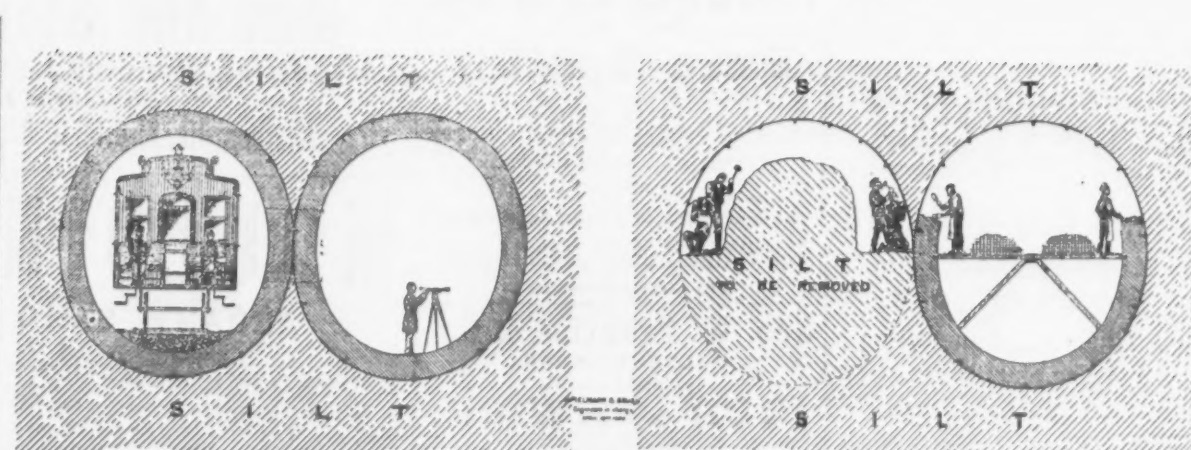


Fig. 2.—Profile of the Hudson River Tunnel, April 12, 1880.

have from time to time followed its progress, and propose now to give a more detailed description, chiefly of the technical features, which, on account of originality and simplicity, are of great interest and reflect credit upon the president and active manager of the company, Mr. D. C. Haskins, of California; the engineers in charge, Messrs. Spielman & Brush, of the University of the City of New York, and the superintendent of the work, Mr. J. F. Anderson, of Sweden, to whom we are indebted for much information and the accompanying illustrations.

The difficulties, inconvenience and expense attending the present method of transferring to New York the freight and passengers from the depots of the great railways, the Pennsylvania, New Jersey Central, New York, Lake Erie and Western and Delaware, Lackawanna and Western are sufficiently appreciated by all who have visited New York to render any comment as to the importance of the new enterprise unnecessary.

The width of the Hudson River on the line of the tunnel, from the foot of Fifteenth street, Jersey city, to Leroy street, New York, is 5500 feet. Fig. 2, which gives a profile of the river as found by recent very careful soundings. These revealed accurately the nature of the ground to be passed through. It will be noticed that fully 3600 feet of the whole length of the tunnel proper passes through what is called "silt" a grayish clay which is comparatively favorable to the safe progress of the tunnel. The sand, which was grazed at the beginning of the work on the New Jersey shore, comes up again near the New York line, and, for a short section of 400 feet, rock enters the floor of the tunnel as at present projected. The



Figs. 3 and 4.—Section of the Hudson River Tunnel.

THE HUDSON RIVER TUNNEL.

second will be commenced at an early date. We may mention that under both shores the double tunnels are united in one, so that as far as the approaches are concerned there will be one large double-track tunnel.

Each of the two tunnels under the river will be very nearly round, having a clear height of about 18 feet and a width of 16 feet. We need hardly point out that this circular form, presenting valuable advantages so far as lining is concerned, adds greatly also to the stability of the structure. As yet work has been done only

section is made between the shaft and the tunnel.

The most interesting and important novelty connected with the construction of the tunnel is the method adopted for excavating and removing the material. Compressed air is used to counteract the water pressure and render the face of the work so dry and so firm that no supports are necessary to retain it. In itself the use of compressed air for this purpose is quite old, having been used for many years to sink shafts through quicksand, and to make

tunnel face, it also performs an important function in serving to convey the material excavated out of the tunnel, the silt being forced out, mixed with water, in the shape of a pulp through a pipe. The free face allows the tunnel lining to follow it closely, and thus exposes to accident only that small section which is actually under course of construction. The tunnel advances with its full section, and beyond a few occasional props to hold the first segments of the iron casing in position, no preliminary timbering or support is necessary. There is something

in reserve. The pressure used generally ranges from 17 to 20 pounds per square inch, which is comparatively low. The air first enters a receiver, and then passes through the supply pipe to the air-lock, and thence into the tunnel.

The face of the tunnel is terraced in the ordinary way in excavating earthwork, and the material, which is dug out at the present time by hand, is thrown to the lower part of the tunnel, whence it is forced in a pulpy state through a pipe to the working shaft, the lower portion of which acts as a receiver for the silt. Approximately the amount of water which is pumped out of the stand pipe for use in rendering the silt pulpy enough to flow through the discharge pipe is one-quarter cubic foot per cubic foot of silt. From the shaft the silt is conveyed at present by a No. 5 Deane pump (4½-inch water cylinder, 7-inch steam cylinder, 10-inch stroke) standing on the air-lock platform to the waste tank, from which it is removed from time to time. The excavation and conveyance of the silt, it will be noticed, is a very simple matter, which is much favored by the fact that no boulders or gravel are ever met. The upper part of the face is kept a few feet ahead, and enough is dug out to make room for the first upper section of a ring of the iron shell weighing about 1500 pounds per running foot. The aim is to keep close up to and ahead of the working face with this shell, completing it all around as early as possible. The sections of this shell are flanged ¼-inch plates, 2 feet 6 inches wide and either 3 or 6 feet long. They are bolted together by their 2½-inch flanges, and are put up in such a way that there are no continuous longitudinal joints. This is at once followed by the masonry, generally in two sections, the more advanced being carried to about one-half the height

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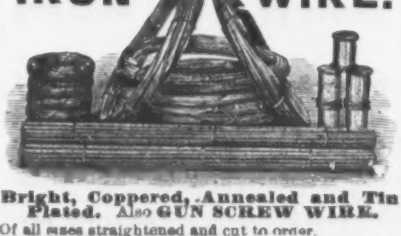
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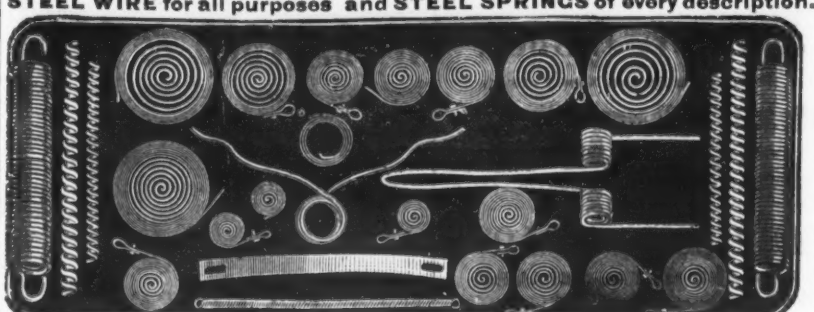
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and the second completing it. The wall is 2 feet thick, of which 1 foot is kept ahead of the other for some distance. The centers are made of light sheet-iron frames, the brick is hard burnt and the cement used is "Norton," mixed with 1 1/2 parts of sand. Both brick and cement are conveyed down to the platform level in the working shaft by being dumped into simple shuttles. Work in the tunnel goes on day and night, there being three eight-hour shifts. At present the rate of advance is about 4 feet per day of 24 hours, but it is expected that the progress will be more rapid in the future. At the time when our illustration was prepared the advance of the works was 104 feet; on the 15th instant the tunnel was 204 feet from the shaft, and by the time that our description has come to the hands of our readers 225 feet will probably be excavated. The electric light is used, both in the tunnel and above ground, the necessary machinery being provided and placed as shown in Fig. 1.

In conclusion, we may state that, judging from the energy with which work is now being driven by the Hudson River Tunnel Company under the active management of D. C. Haskin, its president, there is every likelihood that this, the greatest enterprise of its kind in the world, will be carried to a successful issue.

American Honors at the Australian Exhibition.

Advices from Sydney, N. S. W., under date of March 29 are as follows:
The International Exhibition here has received a prolonged lease of existence, owing to the fact that the Melbourne commissioners decline to receive exhibits for their fair until about July, and as the judges had not quite completed their awards it was decided to keep the show open until the 20th prox. The past month has been more exciting to exhibitors and their agents than any corresponding period since they arrived here. All are anxious to secure favorable awards and learn what the jurors thought of their exhibits. Great complaints have been made regarding the incompetency of the judges, and justly so in some cases. Perhaps the keenest competition in connection with this "International" has been in the department of horology. England, France, Switzerland and Australia being represented by all their greatest makers, the United States by the Waltham Company only, and in some degree the latter have to thank Mr. Manson, their representative here, for the results they have obtained. The Royal Astronomer was fixed upon as the most fitting person to make the crucial tests, and he has finished an exhaustive report illustrated by diagrams. The press of this city has not yet had access to the report courteously supplied to your representative. One paragraph is specially interesting as a high compliment to American enterprise and ingenuity. Speaking of the Waltham watches it says: "In consideration of the fact developed in this examination and the preponderance of elements of inherent and comparative merit (each in independent judgment) being nearly equal to 7 per cent. more than the next highest exhibit, we have found it exceedingly difficult to make such a classification to all. We adjudge the American Watch Company, of Waltham, Mass., U. S. A., a first-class award, and such other special distinction, diploma, medal or award as is consistent with the duties and obligations of the honorable Sydney International Commission for the largest and most complete exhibit of the horological instruments examined."

AMERICAN HONORS.

The awards to citizens of the United States this month are as follows:

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The railroads now approaching the Black Hills seem likely to meet a more definite need of communication than has been the case with some of the Western roads, which have had to first settle the country up and make their own custom before they could get a paying traffic. But the gold discoveries in the Black Hills have brought to them a population such as nothing but gold discoveries could have brought to a spot so remote and difficult of access. There is at present a population of some 40,000 in three organized counties, in spite of the 300 miles that lie between the Hills and the nearest avenues of communication with the world. This 300 miles is equivalent, in time and cost, not to speak of hardships, to the 2000 miles between New York and the point at which the traveler to the Black Hills must leave the railroad. This 300-mile "insulating belt" is soon to be traversed by no less than three railroads, if present plans are carried out. How great a center of activity the country is likely to become with railroad communication, can be guessed from noticing what has been done even without such communication. The capital of the Hills—Deadwood—had a fire that destroyed \$2,000,000 worth of property, little insured; yet but one firm succumbed, and the whole was rebuilt with increased value within six months. There is one bank in Deadwood that does \$500,000 worth of business per month with New York. There are four daily newspapers, telegraphs, telephones, schools and churches. There is, besides, a great extent of rich farming and grazing lands in the neighborhood, and, as the first excitement of mining wears off, men turn to these and develop their capacities. Indeed, the considerable and rapidly growing population of the section renders it imperative that there should be agricultural produce to meet their demands, and therefore the farming land can no longer be allowed to lie idle. The gold product, on which all this sudden development depends, is now said to be fully \$5,000,000 per annum, and steadily increasing.

The French Cable.—The London Telegraph says: Anglo-American cable shares rallied Monday on further rumors of the new French cable having been cut in two by an iceberg. The stock-market idea is that, as the French company will be unable to raise funds for the cost of the recovery and repair of the cable, it will be sold to the Anglo-American Company on the latter's own terms.

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The Proposed Bankrupt Law.

At the last meeting of the New York Chamber of Commerce a report was submitted from a special committee relating to the bankrupt bill now before Congress. It is an extremely interesting and valuable contribution to the discussion of this important question, and though it is not likely to have any immediate effect upon the passage of the measure, which can hardly be taken up at the present session, it ought to be carefully considered. The report, which was presented by Mr. D. C. Robbins, criticises with great particularity the measure prepared by Judge Lowell, of Massachusetts, approving many of its provisions, but suggesting radical changes in others. The point which will strike the general reader with greatest interest is the proposition of the committee of the chamber that "a discharge of the debtor should never be allowed without a careful examination of past transactions, by which recklessness and dishonesty may be punished and discouraged."

This is a perfectly sound proposition, and one which has been ignored to much too great an extent by those on whom the task of framing legislation has fallen. In the opinion of the Committee of the Chamber it has not received from the author of the Massachusetts measure the attention which it deserves. The committee says:

"In Great Britain a trial of the debtor for bankruptcy is regarded as essential. In 1869 the British act was so modified that a debtor might arrange a settlement with his creditors and avoid a trial for bankruptcy, but this amendment has not given satisfaction. A recent bill proposed by the Attorney-General in 1879 disposes of this provision, and insists that all cases of bankruptcy that may occur hereafter, as before 1869, shall receive public trial, without regard to any arrangement that may be made between the debtor and his creditors."

"In Judge Lowell's proposed bill all this is overlooked. A debtor may have made a fraudulent partnership, and may have conducted a reckless and fraudulent business for years, without responsibility to the public, provided that care be taken to keep within the requirements of the act, which are quite limited, for a period of three months preceding his adjudication as a bankrupt."

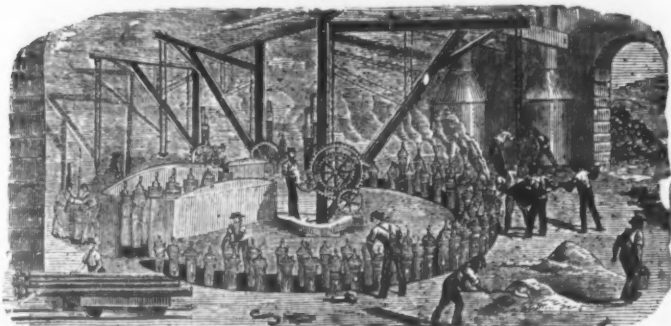
If this be a correct statement of the effect of the bill now before Congress, it cannot be neglected with safety. Nothing is more demoralizing to the whole business community than the possibility of a debtor receiving a legal discharge from indebtedness incurred with intention to defraud, or with a carelessness equivalent to dishonesty. This was the bane of the former bankrupt law. That law might fairly have been described as a legal contrivance for the encouragement of swindling. It was a terror to creditors and to honest debtors as well, but to the clever, unscrupulous sharpers who, unfortunately, infest every branch of trade, it was a welcome refuge when the time of settlement came. Its enormous costs and its expensive delays and great uncertainties, enabled a shifty swindler to hold it over the heads of his creditors as a club by means of which to force their consent to a settlement. Directly and indirectly, it is the opinion of those most familiar with its practical workings, that this law did far more harm than good.

The experiment to which the committee of the Chamber refers as having been made in England in the direction of greater indulgence to the debtor, has been a signal and disastrous failure. The amendments proposed at the last session of Parliament by the Attorney-General not only include the change mentioned by the committee, but several others in the same spirit. For instance, the new bill provides that the right to an absolute discharge be refused where the creditors have not received and are not likely to receive (without any fault on the part of the trustee) at least 50 per cent. of their claims, or where the bankrupt, being a trader, has not kept proper books during the three years prior to his bankruptcy, or has increased his liabilities by carrying on trade while insolvent, or contracted debts without reasonable expectation of being able to pay them; or, not being a trader, has brought on his bankruptcy by reckless speculation or extravagant living. These are more stringent provisions than have ever been enforced in this country, or, for that matter, in Great Britain either, but they are not so severe as some of those which went into effect in Germany on the 1st of October last. In that country, if a bankrupt has gone considerably beyond his means, either by speculation or excess in personal expenditure, or if he has kept his books negligently, or omitted to draw up balance sheets at appointed intervals, he is liable to imprisonment for a term which may reach two years. It will be seen that these old-fashioned Germans actually regard the recklessness which rubs another of his property as a crime, an idea which is quite foreign to American minds.

No business community can be made honest by law, but the standard of the law should, nevertheless, be that of the strictest honesty, and it should never throw its protection about those who do not conform to such a standard, even if it do not punish them for a departure from it. No one can deny that the tone of commercial dealings in this country is far below that of strict honesty. Men who "fail" from carelessness, extravagance, or even worse faults, do not suffer the positive disgrace which they ought to suffer. There is an unwarrantable tenderness for their faults, growing out of the consciousness among their associates, perhaps, that if every man got his deserts, too few of them would go unwhipped of justice. While this is so it would be idle to expect that very stringent laws would be rigidly observed. But such laws would have this advantage—that it would be to the interest of creditors to enforce them, and so gradually they might come to be enforced. In any case, the principle laid down by Mr. Robbins' committee is an essential one—that any law which may be devised will prove a misfortune, unless account is taken of the responsibility of the debtor for the proper management of his business."—New York Times.

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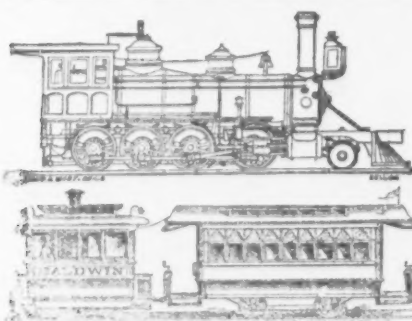
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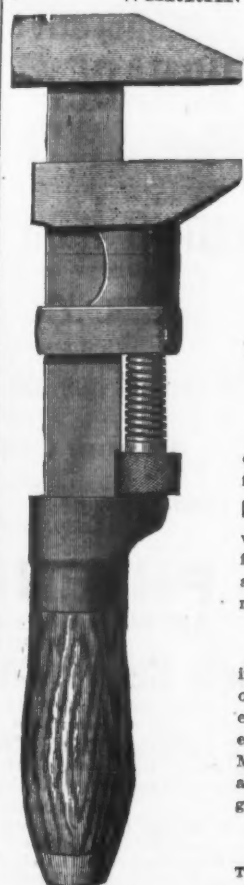
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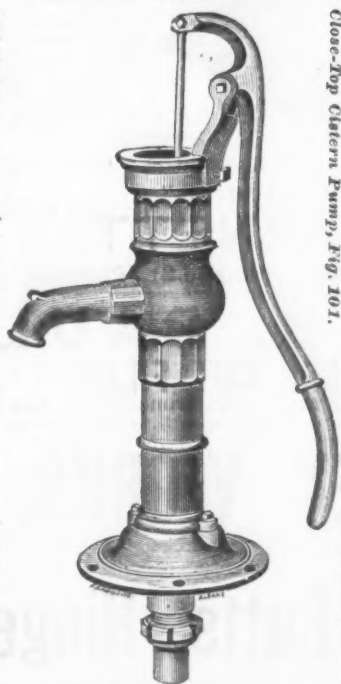
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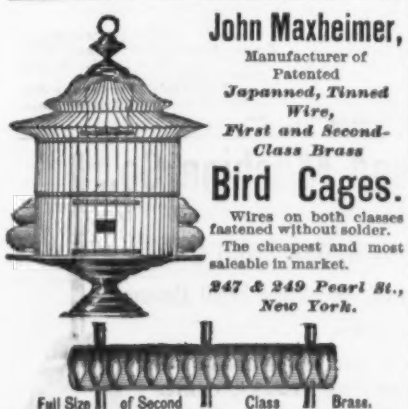
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Cistern Pump.
Fig. 70.



Pitcher Pump.
Fig. 120.



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Pump. Fig. 268.



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Fig. 145.



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The Resistance of Screw Stay Bolts for Boilers.

We had occasion some time since to
refer briefly to a series of very important
experiments, made under the auspices of the
Bureau of Steam Engineering by Chief En-
gineer James P. Sprague, U. S. N., and
Passed Assistant Engineer G. E. Tower,
U. S. N., the object of their inquiry
being to "determine the value and resistance
of screw stay-bolts for boilers under differ-
ent conditions, using iron, steel and copper
plates of different thicknesses." In making
the tests, all plates of each material of the
same thickness were cut from the same
sheet, and all stay-bolts of each material
were made of the same bar. With a view
to showing how important a factor is the
rivet head and the manner in which it is
formed, a series of experiments were made
with the following results: Three trials
each were first made with 1/2-inch iron
plates and 1-inch iron stay-bolts, not riveted,
and riveted over with the ordinary thin or
low conical head. They were simply ar-
ranged so as to show the actual strength to
resist pulling through the plate, the supports
consisting of heavy plates, with a hole 1 1/4
inches in diameter, the boiler plate resting
upon the heavy plate and the stay-bolt ad-
justed to the center of the hole, thus allow-
ing the bolt to have a clear space around it
equal to the overlapping of the riveted head
on the boiler plate. The bolts not riveted

WITH SUPPORTS 4 INCHES FROM CENTER TO CENTER.	
	Pounds.
1-inch bolt, not riveted	21,970
1-inch bolt, ordinary low conical head, three threads left through for riveting	25,147
1-inch bolt, button-head; length left through for riveting equal to 7-16th diam- eter of bolt	33,794
1 1/2-inch bolt, button-head; length left through for riveting equal to one-half diameter of bolt	38,885
WITH SUPPORTS 5 INCHES FROM CENTER TO CENTER.	
	Pounds.
1-inch bolt, ordinary low conical head	22,137
1-inch bolt, button-head; length left through for riveting equal to 7-16th diameter of bolt	31,282
1 1/2-inch bolt, button-head; length left through for riveting equal to one-half diameter of bolt	35,812

In making the experiments in screw stay-
bolts and plates an apparatus was used so
arranged as to represent a section of a fire-
box, hydraulic pressure being used to pro-
duce the strain.

This apparatus, which is shown in section
in our illustrations and in elevation in Fig.
2, consists of a composition ring 4 inches
deep, 18 inches internal and 23 inches ex-
ternal diameter, faced true on both sides,
and having 31 holes for 7/8-inch through
bolts; and on each side of the connecting
pipe to the pump a hole was tapped for a
bolt of the same diameter. These holes were
laid off and drilled equidistant on a circle
20 1/4 inches in diameter. The bolts for
securing the plates to the ring were of steel,
turned and chased to fit 7/8-inch hexagonal

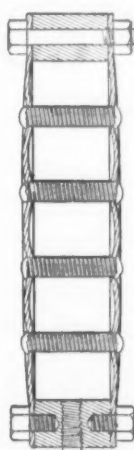


Fig. 1.

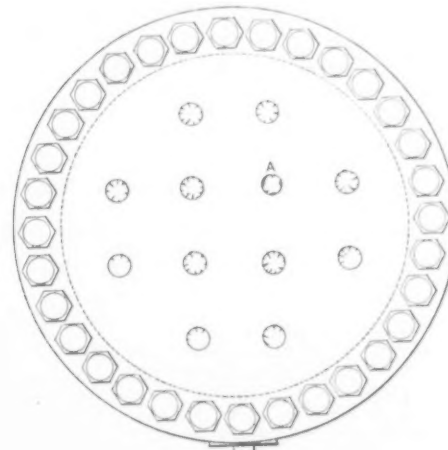


Fig. 2.

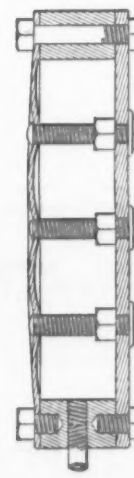


Fig. 3.

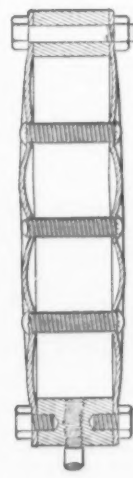


Fig. 4.



Fig. 5.

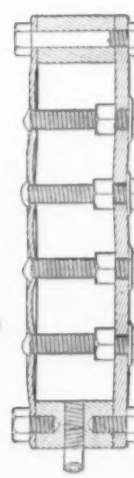


Fig. 6.

drew out at an average strain of 32,785
pounds; those riveted with the low conical
head made according to general practice, by
leaving three threads through to form the
head, required an average strain of 35,033
pounds to draw them through the plate, the
rivet head giving an additional strength of
2248 pounds in a 1-inch stay-bolt.

In testing those with low conical heads, it
was observed that the bulging of the plates
caused the lap of the rivet head on the plate
to commence giving way and to break off
some time before the maximum strain was
reached, thus leaving more for the threads
on the bolts to sustain. As the strain and
bulge of the plates increased, the plate
around the bolt turned downward and out-
ward until the threads in the plate almost en-
tirely cleared those on the bolts, so that in
almost every case there were only from one
to two threads stripped or injured on the
bolt when it drew out; therefore it was
deemed advisable to form the head in a
different manner, and, after several experi-
ments, it was decided that the rivet head
should be made as follows: First, by leav-
ing as much of the bolt through the plate as
could be riveted over without injury to the
iron, which was, in case of the excellent
iron being used, equal in length to about
one-half the diameter of the bolt. This was
riveted over in the following manner: A
few quick, sharp blows were struck on the end,
slightly upsetting the iron; the head was
then formed to shape with a button-head set
made to a spherical segment. It was found
that this could be done in nearly the same
time as that used in riveting the ordinary
low conical stay-bolt heads at the Washing-
ton yard, and with much less injury to the
iron; also, that it only required one riveter
and a helper; whereas, by the old method,
two riveters were used.

Three trials were then made with half-inch
iron plates and 1-inch iron stay-bolts, not
riveted; riveted with ordinary low conical
head, with three threads left through for
riveting; riveted with button-head, a
little over five threads left through for
riveting; and with button-head the size of
stay-bolt being increased to 1 1/4 inches. The
supports were by bolts in each corner of the
plate, 4 inches and 5 inches from center to
center of supports; the stay-bolt being in
the center of the plate, equally distant from
each support. The ultimate average strain
required to pull the above bolts through the
half-inch plate was as follows:

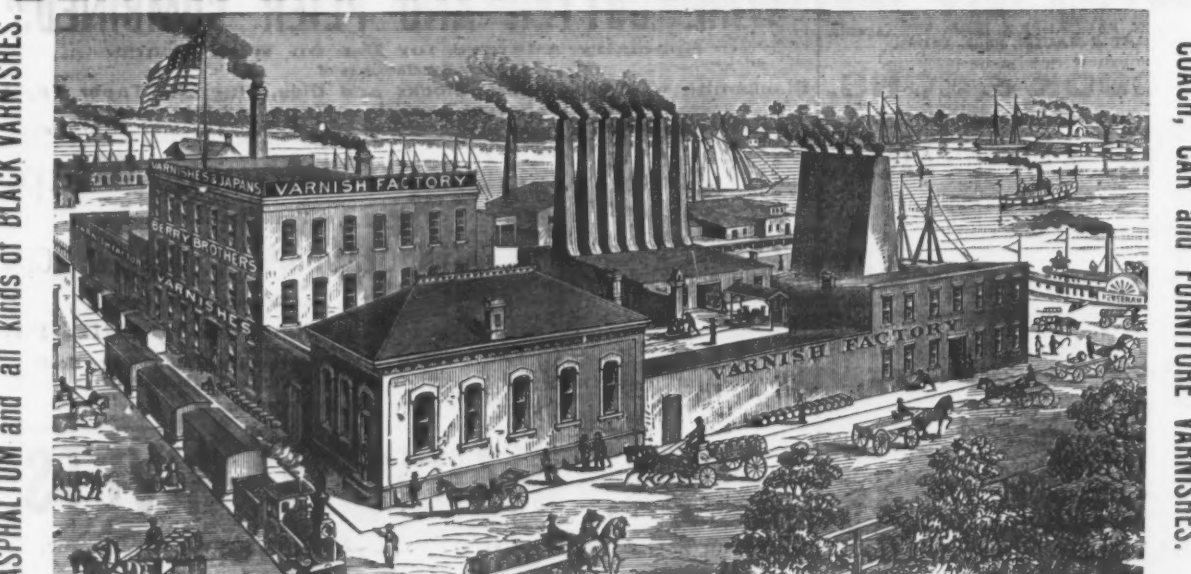
The joints between the plates and
ring were made with a sheet-lead gasket
coated with soft red-lead putty. After a
few experiments with stay-bolts riveted at
both ends, and plates of equal thickness on
both sides of the ring (for economizing the
number of plates used), a 3/4-inch steel plate,
having holes that allowed the stay-bolt to
pass freely through them, was used for a
back plate, as is shown in the drawings of
most of the experiments. The stay-bolts
where they passed through the back plate
were packed under the washer with lamp-
wick and red-lead putty, and the nuts were
screwed up firmly before the riveted head
was made on the other end of the bolt. All
the experimental plates were cut to the di-
ameter of the outside of the composition ring,
made flat, and the holes drilled accurately.
The steel plates used were manufactured by
the Otis Steel Company, who also furnished
the steel stay-bolts, the material for which
possessed a tensile strength of 58,869 pounds
for the 1-inch bars, and of 52,825 per square
inch for the 1 1/4-inch bars. The iron stay-
bolts were made from 1 1/4 inch and 1 1/2 inch
round bars that had stood bending through
180 degrees cold without showing signs of
fracture, and of a tensile strength ranging
from 51,000 to 52,000 pounds per square
inch. From the 45 experiments made, of
all of which illustrations are given in the
report, we chose a number to show how the
nature of the material, the distance between
the bolts, the condition of trial, &c., affect
the result. In Figs. 1 and 2, iron plates and
iron stay-bolts, the heads of the latter being
shaped in the approved way with a button-
head set to spherical segments. The main
dimensions were:

Thickness of plates, inch	3/4
Distance from center to center of stay bolts, in	23
Diameter of stay bolts outside of threads, inch	1
Diameter of stay-bolts inside of threads, inch	9/16
Diameter of stay-bolt heads at base, inches	1 1/2
Height of stay-bolt heads, inch	7/16
Number of threads on stay bolts per inch	12
Number of threads left projecting to form head	3
Tensile strength of each stay-bolt, lbs.	32,785

At a pressure of 800 pounds the bulge was
1-16th of an inch, which was increased at
1000 pounds to 23 64ths of an inch, the first
leak appearing around the stay-bolt heads.
At 1300 pounds the set was 17-32ds of an
inch, and the bolt head marked A, in Fig.
2, was stripped at the bolt, while the
others were damaged, as shown in the
drawing.

Fig. 3 was chosen as an example of the

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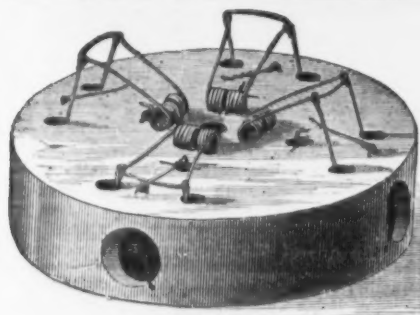
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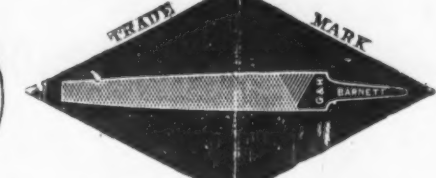
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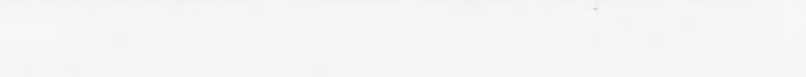
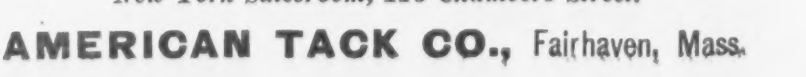
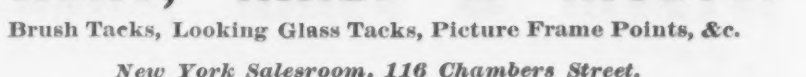
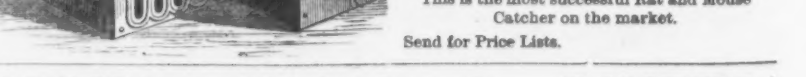
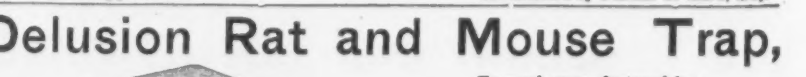
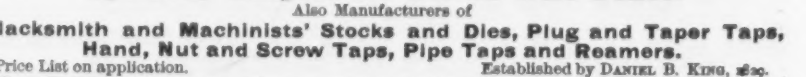
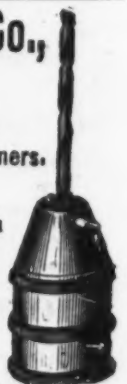
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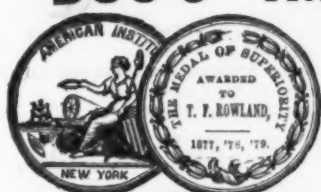
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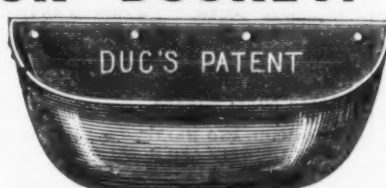
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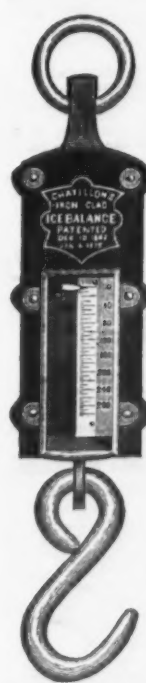
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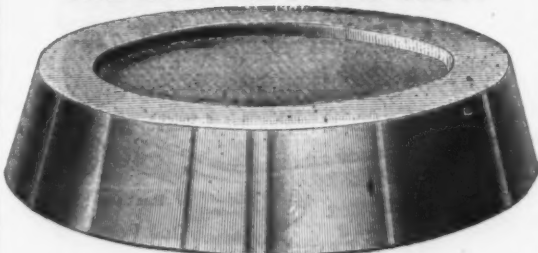
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effect of shaping the iron stay-bolt heads in the form of low cones. The plates were of iron. The principal dimensions were:

Thickness of plate, inch..... 3/4
Distance from center to center of stay-bolts, in..... 5
Diameter of stay-bolts outside of threads, inch..... 1-1/2
Diameter of stay-bolts inside of threads, inch..... 1-1/4
Diameter of stay-bolt heads at base, inches..... 1 5/16
Height of stay-bolt heads, inch..... 7/16
Number of threads on stay bolts per inch..... 12
No. of threads left projecting to form head..... 5
Tensile strength of each stay-bolt, lbs..... 33,000

At only 200 pounds pressure the bulge was 1-32d of an inch; this rose to 1-16th of an inch at 300 pounds, the set being 1-32d of an inch; at 400 pounds these figures had increased to 1/4 and 1-16th of an inch respectively, and they reached 9-32ds and 1/4 at 500 pounds. At the latter pressure the center stay-bolt was badly split around its edges and leaked on relieving the pressure from that point. At 580 pounds the head and thread stripped from the center bolt, while the other bolt heads were but slightly damaged.

Compared with this, Fig. 4 shows some improvement, the stay-bolts having been formed with a button-head set. The chief dimensions were:

Thickness of plates, inch..... 3/4
Distance from center to center of stay-bolts, in..... 5
Diameter of stay-bolts outside of threads, inch..... 1-1/2
Diameter of stay-bolts inside of threads, inch..... 1-1/4
Diameter of stay-bolt heads at base, inches..... 1 5/16
Height of stay-bolt heads, inch..... 7/16
Number of threads on stay bolts per inch..... 12
No. of threads left projecting to form head..... 5
Tensile strength of each stay-bolt, lbs..... 32,979

A bulge of 1-16th of an inch became noticeable at 300 pounds, which increased

Diameter of stay-bolts outside of threads, inch..... 1-1/2
Diameter of stay-bolts inside of threads, inch..... 1-1/4
Diameter of stay-bolt heads at base, inches..... 1 5/16
Height of stay-bolt heads, inch..... 7/16
No. of threads on stay bolts per inch..... 12
No. of threads left projecting to form head..... 5
Tensile strength of each stay-bolt, lbs..... 32,685

The following tables show the bulge and set at various pressures:

Fig. 6.			Fig. 7.		
Pressure.	Bulge.	Set.	Pressure.	Bulge.	Set.
Pounds.	Inches.	Inch.	Pounds.	Inches.	Inch.
100	0	0	100	0	0
200	1-32	0	200	1-32	0
300	1-16	0	300	1-16	0
400	1-32	0	400	1-16	0
500	1-16	0	500	1-16	0
600	3-64	0	600	3-64	0
700	1-16	0	700	3-64	0
800	5-64	3-64	800	13-32	3-16
900	3-16	3-64	900	13-32	3-16
1,000	9-32	9-32	1,000	15-32	3-16
1,100	25-64	23-64	1,100	15-32	3-16
1,150	15-32	15-32	1,150	15-32	3-16

While in Fig. 6 no leaks were apparent at 1000 pounds, although all stay-bolt heads were considerably split at their edges, the center stay-bolt was badly split around its edges at 350 pounds pressure, in the case of Fig. 7. The first leaks appeared on relieving the pressure from 400 pounds, and under 500 pounds the head was stripped from the center bolt.

The results of using thicker plate are exhibited by Figs. 8, 9 and 10, which at the same time show the difference between iron (Fig. 8) and steel (Figs. 9 and 10) stay-bolts.

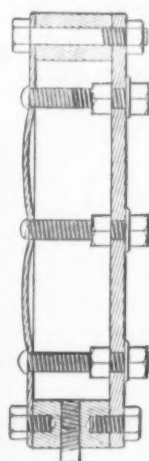


Fig. 7.

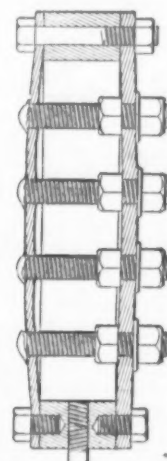


Fig. 8.

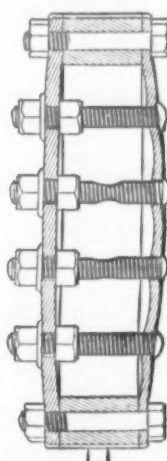


Fig. 9.

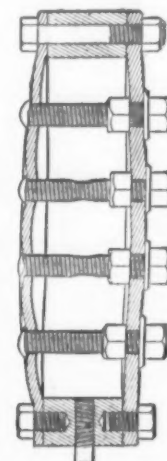


Fig. 10.

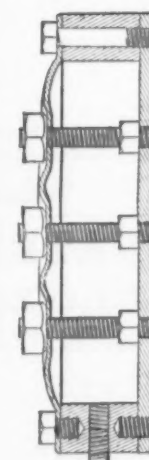


Fig. 11.

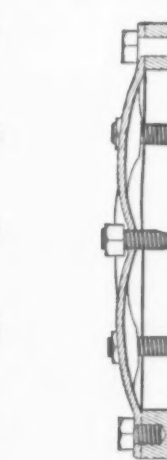


Fig. 12.

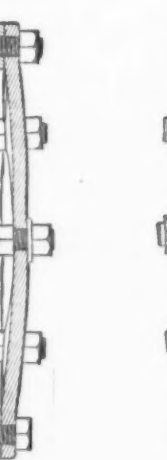


Fig. 13.

to 1/2-inch by the addition of 100 pounds of pressure, a set of 3-32ds of an inch taking place. At 500 pounds both bulge and set amounted to 7-16ths of an inch, and the box leaked considerably at both ends of the center stay-bolt, and most of the other stay-bolt heads were split at their edges. At 700 pounds the head stripped from the center stay-bolt and the bolt drew clear of the hole.

The effect of a thicker plate and a smaller number of iron stay-bolts is clearly visible in the results of testing the box shown in Fig. 5, the main data relating to which are as follows:

Thickness of plates, inch..... 1/2
Distance from center to center of stay bolts, inches..... 7
Diameter of stay-bolts outside of threads, inch..... 1-1/2
Diameter of stay-bolts inside of threads, inch..... 1-1/4
Diameter of stay-bolt heads at base, inches..... 1 5/16
Height of stay-bolt heads, inch..... 7/16
No. of threads on stay bolts per inch..... 12
No. of threads left projecting to form head..... 5
Tensile strength of each stay-bolt, lbs..... 32,850

The effect of the pressure is most strikingly exhibited by the following table, giving the greatest bulge and the permanent set, measured at points between stay-bolts:

Pressure.	Bulge.	Set.
Pounds.	Inches.	Inches.
200	1-32	1-64
300	1-16	1-32
400	3-64	1-32
500	1-16	3-64
600	5-64	3-32
700	1-16	1-16
800	11-32	5-16
900	13-32	3-8
1,000	15-32	7-16
1,100	9-16	9-16
1,200	21-32	3-16

The first leak appeared around the center stay-bolt on relieving the pressure from 700 pounds. The center stay-bolt head drew off while under a pressure of 1000 pounds, and the other bolt heads leaked badly at that pressure.

In all the experiments quoted until now, the stay-bolts were riveted at both ends. In those now following a 3/4-inch steel plate was used as a back-plate. In Figs. 6 and 7 we illustrate an experiment with Otis steel plates and iron stay-bolts, the latter being close together in the first case, and far apart in the latter. The effect will be fully apparent from the results given below. The chief dimensions were equal for Figs. 6 and 7, except that the distance from the center to center of stay-bolts was 4 and 7 inches respectively:

Thickness of plate, inch..... 3/4
Distance from center to center of stay-bolts, inches..... 4 and 7

The main data are as follows:

Thickness of plate, inch..... 3/4
Distance from center to center of stay-bolts, inches..... 4
Diameter of stay-bolts outside of threads, inch..... 1 1/2
Diameter of stay-bolts inside of threads, inch..... 1 1/4
Diameter of stay-bolt heads at base, inches..... 1 5/16
Height of stay-bolt heads, inch..... 7/16
No. of threads on stay bolts per inch..... 12
No. of threads left projecting to form head..... 5
Tensile strength of each stay-bolt, pounds..... 51,277 41,489

The greatest bulge and permanent set was in the case of Figs. 8, 9 and 10, as follows:

Fig. 8.			Figs. 9 and 10.		
Pressure.	Bulge.	Set.	Pressure.	Bulge.	Set.
Pounds.	Inch.	Inch.	Pounds.	Inch.	Inch.
100	0	0	1,000	1-64	0
200	1-64	0	1,200	1-32	0
300	1-32	0	1,400	1-16	0
400	1-16	0	1,600	3-64	1-32
500	1-16	0	1,800	3-32	1-16
600	1-16	1-64	2,000	5-32	3-8
700	1-16	1-16	2,200	7-32	3-16
800	1-16	1-16	2,400	9-32	1-4
900	1-16	1-16	2,600	11-32	1-4
1,000	1-16	1-16	2,800	13-32	1-4
1,100	1-16	1-16	3,000	15-32	1-4
1,200	1-16	1-16	3,200	17-32	1-4
1,300	1-16	1-16	3,400	19-32	1-4
1,400	1-16	1-16	3,600	21-32	1-4
1,500	1-16	1-16	3,800	23-32	1-4
1,600	1-16	1-16	4,000	25-32	1-4
1,700	1-16	1-16	4,200	27-32	1-4
1,800	1-16	1-16	4,400	29-32	1-4
1,900	1-16	1-16	4,600	31-32	1-4
2,000	1-16	1-16	4,800	33-32	1-4
2,100	1-16	1-16	5,000	35-32	1-4
2,200	1-16	1-16	5,200	37-32	1-4
2,300	1-16	1-16	5,400	39-32	1-4
2,400	1-16	1-16	5,600	41-32	1-4
2,500	1-16	1-16	5,800	43-32	1-4
2,600	1-16	1-16	6,000	45-32	1-4
2,700	1-16	1-16	6,200	47-32	1-4
2,800	1-16	1-16	6,400	49-32	1-4
2,900	1-16	1-16	6,600	51-32	1-4
3,000	1-16	1-16	6,800	53-32	1-4
3,100	1-16	1-16	7,000	55-32	1-4
3,200	1-16	1-16	7,200	57-32	1-4
3,300	1-16	1-16	7,400	59-32	1-4
3,400	1-16	1-16	7,600	61-32	1-4
3,500	1-16	1-16	7,800	63-32	1-4
3,600	1-16	1-16	8,000	65-32	1-4
3,700	1-16	1-16	8,200	67-32	1-4
3,800	1-16	1-16	8,400	69-32	1-4
3,900	1-16	1-16	8,600	71-32	1-4
4,000	1-16	1-16	8,800	73-32	1-4
4,100	1-16	1-16	9,000	75-32	1-4
4,200	1-16	1-16	9,200	77-32	1-4
4,300	1-16	1-16	9,400	79-32	1-4
4,400	1-16	1-16	9,600	81-32	1-4
4,500	1-16	1-16	9,800	83-32	1-4
4,600	1-16	1-16	10,000	85-32	1-4

In the experiment illustrated in Fig. 8, a few small radial cracks had appeared in the edges of nearly all of the stay-bolt heads at 2200 pounds; they increased in number and size as the pressure was raised, and at 2700 pounds the edges of all the heads were badly cracked. The first leaks appeared around two stay-bolts at 2900 pounds, and at 2950 pounds enough others started to rapidly lower the pressure, although the pump was driven at its full capacity. In the experiment illustrated by two views—Figs. 9 and 10—the stay-bolt heads showed no signs of yielding until a pressure of 3000 pounds was reached, when some of them commenced to turn up slightly around their edges. The head and threads stripped from one stay-bolt on the pressure reaching 3100 pounds. None of the others showed any cracks or leaks. The outside diameter of two other bolts was reduced by the strain to 1 inch, and of two

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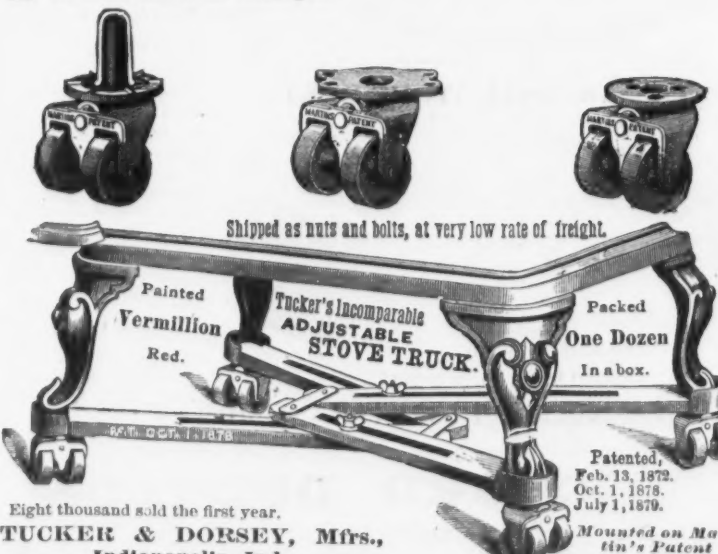
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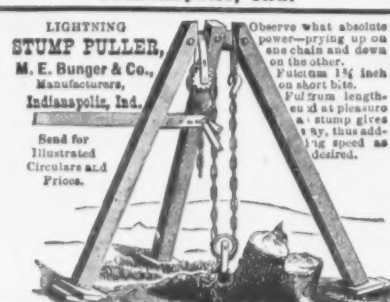
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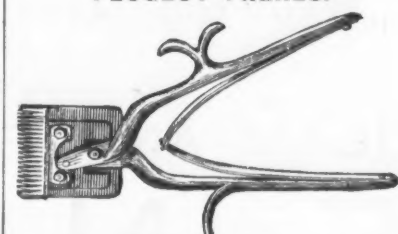
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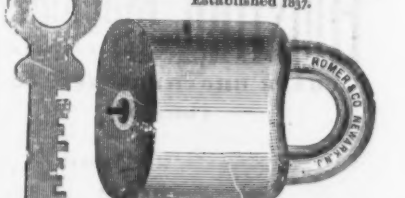
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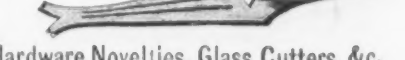
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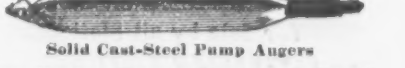
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more to 13-16ths and 15-16ths of an inch respectively. During the test a number of the steel bolts in the rim were broken and replaced by others.

It will be noticed how considerably some of the bolts were reduced in section by the stress.

In conclusion we show illustrations of some of the experiments made with iron plates and stay-bolts with nuts used in place of riveted heads.

The main data relating to Figs. 11, 12 and 13 are as follows:

	Fig. 11.	Fig. 12.	Fig. 13.
Thickness of plate, inch.	1/4	3/8	1/2
Distance from center to center of stay-bolt, inches.	5	8	8
Diameter of stay-bolts outside of threads, inch.	1	1	1 1/4
Diameter of stay-bolts inside of threads, inches.	9/10	9/10	1 13/100
No. of threads on stay-bolts per inch.	12	12	12
Outside diameter of bearing surface of nuts, inches.	2 3/10	2 1/2	2
Inside diameter of bearing surface of nuts, inches.	1 3/4	1 1/2	1 3/4
Thickness of nuts, inches.	1 1/4	1 1/4	1 1/4
Tensile strength of each stay-bolt, pounds.	32,399	32,615	52,031

The greatest bulge and permanent set at different pressures, measured at points between the stay-bolts, were as under:

	Fig. 11.	Fig. 12.	Fig. 13.
Pressure, Pounds.			
Bulge, Inches.			
Set, Inches.			
300	1-64	0	1-64
400	1-64	0	1-64
500	1-16	1-16	1-16
600	1-16	1-16	1-16
700	1-16	1-16	1-16
800	1-16	1-16	1-16
900	1-16	1-16	1-16
1,000	1-16	1-16	1-16
1,100	1-16	1-16	1-16
1,200	1-16	1-16	1-16
1,300	1-16	1-16	1-16
1,400	1-16	1-16	1-16
1,500	1-16	1-16	1-16

In the first experiment, Fig. 11, a leak appeared at 800 pounds, but at 1500 pounds one stay-bolt snapped off flush with the outside of the plate, and when the nuts were taken from the stay-bolts a crack was found on one side of the center hole. In the second experiment, in which the distance between the stay-bolts was large, the first leak appeared at 800 pounds, and when the plate was taken from the ring a number of cracks were found around the center stay-bolt hole. In the third experiment, a leak showed at 900 pounds, and at 1200 pounds four steel bolts broke.

Messrs. Sprague and Tower find in comparing the results of three different thicknesses, in each case (1/4, 3/8 and 1/2-inch plate) of iron plates and iron bolts, steel plates and steel bolts, the diameter of the bolts being 1, 1 1/4 and 1 1/2-inch, their distance apart and conditions of trial being the same, that the strain required to draw the bolts through the plates was equal to 74.77, 77.36 and 85.42 per cent., respectively, of the tensile strength of the bolt.

From their experiments they derive the following formulae, which will correctly and safely represent the working strength of good material in flat surfaces, supported by screw stay-bolts with riveted button-shaped heads or with nuts, when the thickness of the plates forming said surfaces and the screw stay-bolts are made in accordance with the dimensions and conditions given in Table I. W = safe working pressure; T = thickness of plate; d = distance from center to center of stay-bolt:

For iron plates and iron bolts.	W = 24000	T ²
For low steel plates and iron bolts.	W = 25000	T ²
For low steel pits. and low steel bolts.	W = 26000	T ²
For iron pits. and iron bolts, with nuts.	W = 40000	T ²
For copper plates and iron bolts.	W = 14500	T ²

To obtain the ultimate bursting pressure, multiply the results of the above formulae by 8, which is the factor of safety used.

TABLE I.—Dimensions and conditions for making iron and low steel screw stay-bolts for flat surfaces subject to internal pressure for distances ranging from 4 to 8 inches (inclusive) from center to center of stay-bolt.

Thickness of plate, inch.	Diameter of bolt outside of thread, inch.	Number of threads per inch.	Length of bolt left through for riveting in fractions of inch.	Diameter of bolt, inch.	Height of rivet head when finished, inch.	Diameter of base of rivet finished, inch.	Breadth of annular surface, inch.	Dished out to a depth of, inch.
1/4	1 1/4	12	3/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4
3/8	1 3/8	12	3/4	1 3/8	1 3/8	1 3/8	1 3/8	1 3/8
1/2	1 1/2	12	3/4	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2

In conclusion, Messrs. Sprague and Tower advise that the rivet heads be a segment of a sphere, formed by first upsetting the end of the bolt with a few quick, sharp blows of the hammer, then finished to shape with the hammer and button-head set. Where nuts can be used instead of riveted heads, they should be of the standard size, suited to the diameter of the bolt, faced on the side bearing on the plate, and dished out so as to form an annular bearing surface of as large a diameter as the nut will allow, and of a breadth and depth given in the table. Before securing the nut in place the dished portion should be filled with red-lead putty, made stiff with fine iron borings.

The Great Eastern is to be once more made useful. This huge vessel has been for years an elephant on the hands of her owners, and has been doing nothing except lying at anchor at Milford Haven, in England, a constant expense and no use. Her owners were convinced that keeping her thus was, on the whole, less costly than sending her to sea. But now that it is known that the City of Rome is to lack only a few feet of the length of the Great Eastern, and draw about as much water, it is possible that this knowledge may have influenced the owners of the latter vessel to give her another trial, and see if it

is totally impossible to make her commercially profitable. She will have to be refitted to some extent, and her paddles are to be replaced by screws. She is to be prepared for the American cattle trade. It is suggested, however, that she will find her chief occupation and profit in the transportation westward of immigrants. With the present tremendous immigration to America, the demand for carrying facilities presses close on the supply, and if a vessel of such capacity as the Great Eastern should begin plying, just as the demand was overtaking the supply, she might find a fine business ready to fall to her. She has room to bring over 3000 persons at a trip.

Private Brands of Tin Plates.—The Other Side of the Question.

The following letter on this important subject appears in *The Metal Worker*:

To the Editor of *The Metal Worker*.—DEAR SIR: Before your threat to root out and thoroughly exterminate the practice of using private brands of tin plates, as indicated by your editorial of the 1st inst., is put into execution, I beg leave to present for your consideration some observations on the other side of the question, with the object of endeavoring to show that the practice that has been so vehemently condemned in your editorial and correspondence departments is a perfectly legitimate and proper one. The proof of the old saying, that one side of a question is good until the other is heard, cannot, I think, be better exemplified than in this discussion, where all the arguments up to the present time have been in favor of abolishing the practice of using private brands, and no one has had the inclination to take up the cudgels in defense of the practice, and thus, in a manner, have allowed judgment to be taken against them by default.

In the face of the indorsement of the good faith, by your English contemporary the *Ironmonger*, of the author of the communication signed "One Who Knows the Trade," quoted in *The Metal Worker* of April 10, I venture to characterize the statement that such practices as he describes are general, or are even frequently resorted to, as a gross libel on the characters of the tin-plate manufacturers of England and the importers of this and other countries—two classes of business men whose integrity and reputation for fair dealing stand as high as those of any other class of merchants. If this practice of using private brands on tin plates is to be indiscriminately condemned and the parties dealing in and selling such brands held up to public execration, there is not a prominent importing house in the United States who will escape the severe censure your article of the 1st inst. bestows on those using these brands. One prominent house in particular—Messrs. N. & G. Taylor Company, of Philadelphia—would be compelled to put their shutters up, because their well-known brands of "Hendy" and "Old Style," and almost every other brand they have for sale, are private—that is, no other house keeps them. Among the New York houses who use private brands, Messrs. Phelps, Dodge & Co. must be included; their "Pontymester," "Howard" and several others I might mention, are essentially private, and they cannot be obtained of any other house. Thus you will see what a formidable task you have undertaken to root out and thoroughly exterminate the practice of using private brands.

Instead of private marks or words on a box of tin plate being for the purpose of deceiving or swindling consumers, an investigation will show quite the contrary to be its purpose. A similar practice is customary in almost all branches of business. In the tin-plate business the brands of the importers are often placed on the boxes for the same reason that the manufacturers' names of stoves are frequently changed at the request of their customers—to give the dealer a certain control of the article in the locality where he does business. Last fall a certain stove manufacturing firm in Peekskill had five different names which they put on one of their ranges, to accommodate the same number of their customers in New York city and vicinity. If any advantage could be gained by doing so, I could mention the name of a tin-plate manufacturer whose office is in Liverpool, who has four different brands which he substitutes for his own brand, according to the request of a like number of importers in New York. To illustrate how the private-brand business is transacted, let us suppose that A. & Co. are importers of tin plates, and that B. & Co., C. & Co. and D. & Co. are in the same line of business. These houses are all anxious to do business, and there is an active competition constantly going on among them. They each have a representative or correspondent residing in Liverpool, and he is in frequent communication with the makers, whose works are situated in Wales. The representative of A. & Co. sends them a sample box of plates, which, after thoroughly testing, they think is saleable, and in due course they order a quantity, to be made fully equal to sample, and, in order that A. & Co. may have control of the brand, to the exclusion of the other firms, a new name is suggested as a substitute for the makers' brand, which, it is stipulated, must be for their (A. & Co.'s) sole use and benefit. The makers comply with the suggestion; their own brand—which is often an unpronounceable Welsh jaw-breaker—is laid aside, and the simple Anglo-Saxon word of the importer is burnt upon the boxes. After the plates arrive in this country, the importers write to their customers and advertise in the newspapers, describing the new plate and claiming to be the sole importers of that particular brand. Is there anything wicked in such a practice?

A maker of tin plates who would fill an order by substituting an inferior quality to that stipulated, would soon find himself without orders, and the exporter or importer who would either attempt to sell wasters without the letter "W" branded on the boxes, or brand the words "Charcoal Primes" on common coke wasters, as stated by "One Who Knows the Trade," would find himself soon forced out of the business. Consumers, particularly the small dealers in country towns may not be

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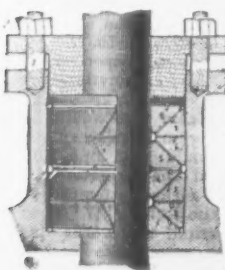


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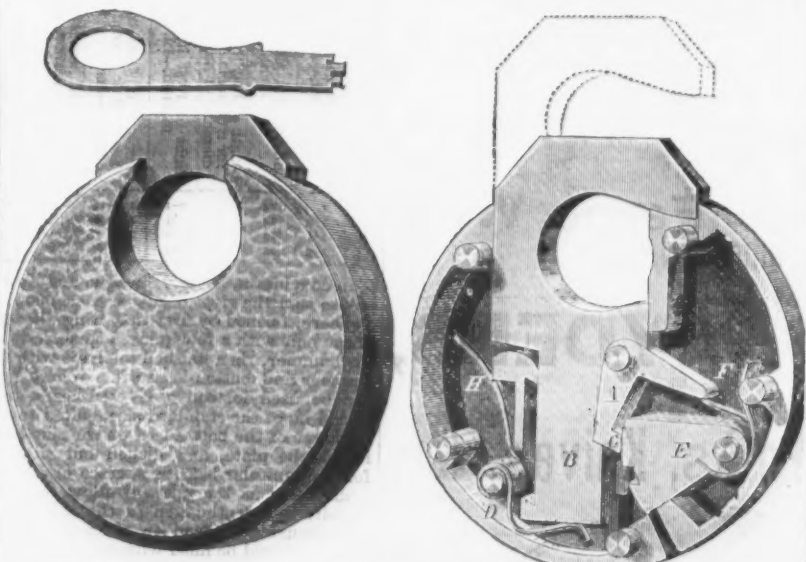
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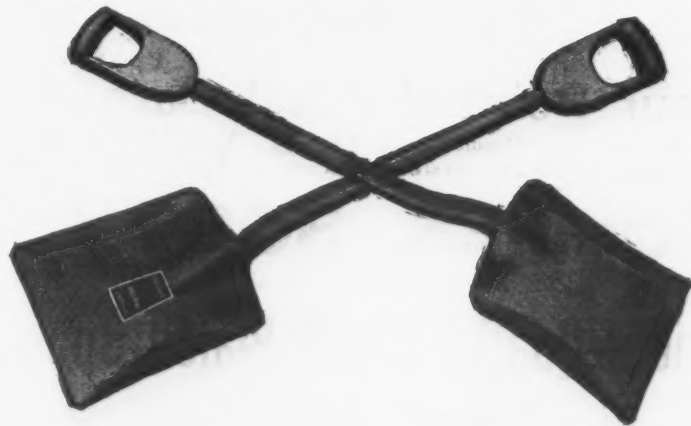
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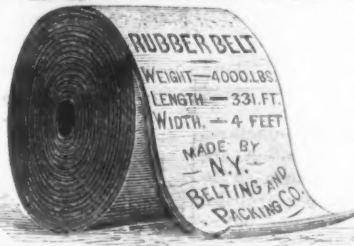


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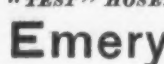
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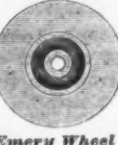
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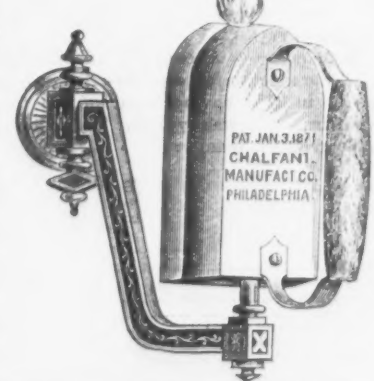
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the best judges of the quality of tin plates, but no person among them that has had any experience whatever in handling or working sheets of tin is so densely ignorant as to be incapable of telling the difference between the various grades I have mentioned! The large consumers—such as the can makers, the tinware manufacturers and the larger roofers—pay very little attention to the marks on the boxes, whether private or makers' brands, but judge the quality of a plate by actually testing and working a sample sheet or sheets. To them the brands are only useful for reference, as there are so many grades that the sheets have to be called something.

In my opinion, a publication of the makers' brands will be of little service to the trade—at least, I don't think such a publication would be fair without the private brands. You will find as much difference of opinion as to the quality of well-known makers' brands as there is as to the numbers of squares of tin roofing one man can lay in 10 hours; how many joints of stove pipe he can make in a second, or how many 8-inch wash boilers can be made in a week. I once saw an order from a country roofer to send him 10 boxes termed "M F" or "Abercane." There is about as much difference in the quality of these two plates as there is between muslin and linen.

If this communication was not already too long, I might go into the defense of another and analogous prejudice that seems to exist about the quality of tinware. I will simply say that, while there is a great deal of trash manufactured, the demand for which, I take pleasure in stating, has materially lessened since the good times set in, no one can deny that there is also to be had tinware that, for quality and beauty, viewed in an artistic sense, surpasses anything ever made in the same line of business since the earth was first "evolved" out of chaos—or, according to some authorities, before that time. Tinware manufacturers conduct their business in the same manner as other manufacturers—they make what the people will buy. A like defense could be made on behalf of that much-abused class, tin roofers, many of whom are often the victims of dishonest architects, and who are expected to put on "M. F." and other "charcoal primers" at less than the market rates for common coke wasters. I can name several firms in New York city who can put on as good a tin roof as ever was laid when the so-called superior quality of plates were in existence, but they will have to be paid their price for doing it.

The writer, although not in a position to give an *ex cathedra* opinion of all the ins and outs of the tin plate business, claims to know whereof he writes, since he held a confidential position in a New York metal importing house during a period of 10 years, and was for five years a large consumer and user of sheet tin of all qualities, whether branded with makers' own or importers' brands, in the business of making household tinware. McC.

May 5, 1880.

Commenting on this letter *The Metal Worker* says editorially:

The discussion of this subject so far, referring to the letters and editorials which have appeared of late in *The Metal Worker*, would seem to indicate that there was but one possible side to the question. The evils of the practice are freely admitted by every one. Manufacturers condemn it, importers and dealers admit that it injures trade, and claim that they follow it only by force of circumstances; consumers deprecate it, and complain loudly that among the multiplicity of brands it is impossible to make a selection which brings good stock to their shops. We therefore gladly give space to a letter which appears in another column, coming to us over the signature of a man whose acquaintance with the trade demands for his communication the most careful attention. The writer attempts to present what he calls "the other side of the question." We trust all who are interested in this subject will give that letter careful perusal.

Certain well-known brands of plates, the quality of which is not questioned, so far as we know, and the names of certain houses prominent in the tin plate trade are mentioned in this communication, and the inference is drawn that any attack upon private brands must necessarily be an attack upon the integrity of all houses owning special brands, and must cast a slur upon the particular brands named by our correspondent. This does not necessarily follow, and the reason for it may be stated in a very few words. By "private brand," in the sense in which it has been used in the letters and editorials in *The Metal Worker*, is meant a mark applied arbitrarily to a box of plates for purposes of influencing the market price of the article. A brand employed simply as a trade-mark of a merchant is not to be objected to; a brand applied by a manufacturer to a certain grade of tin, and used exclusively upon that grade of tin, whether it be sold in the open market or disposed of to one particular firm, is entirely legitimate. The "private brand" that is objected to is a thing of no responsibility. It is a name which is placed upon boxes containing good plates at the start and continued until a trade is established, and afterward is applied to boxes containing inferior plates in order to produce greater profit. The true use of a "brand" is to indicate the make and quality of the contents of the box on which it is used. When it is applied otherwise than this, it is utterly worthless and meaningless. The practice of merchants branding their purchases, obtained from different makers, with one and the same brand is misleading, and it is this practice that we are condemning.

To illustrate to what an extent this practice is carried on in England, we will quote from a letter we find in the *Ironmonger* of April 17. The writer first refers to the position taken by the *The Metal Worker* upon this subject, which he fully sustains, and then admits the justness of the complaints coming from this side of the water. He pictures the extent of the abuse in the following words: "But, beside the consumer's complaint, the statement of 'Tin Plate Merchants' that there are now '1500 private brands, and 350 makers' brands, and immediately you have an overwhelming proof that the consumer does

"not complain without cause, inasmuch as 'the 350 makers of tin plate are going under' 1500 aliases, thus making 1850 names for '350 kinds of plates.'" While keeping this in mind, it must also be remembered that considerable quantities of tin plates have been imported without brands, and have been "named" here to suit purchasers. Surely it is time something were done to correct an evil of such magnitude.

The correspondent referred to above asks at the close of one of the paragraphs in his letter: "Is there 'anything wicked in such a practice?'" He recites, before asking this question, an imaginary case where "A. & Co." order a certain grade of plate made, and have put upon it a brand of their own selection in order to retain the exclusive control of the market in that brand. Incidentally he calls attention to the possibility of some Anglo-Saxon word replacing an "unpronounceable Welsh jaw-breaker," as one of the advantages in this arrangement.

To answer his question briefly, we would say that there is nothing wicked in such a practice, but such a practice, though innocent in itself, may be most outrageously abused. Suppose "A. & Co.," after working up a trade in this particular brand of tin plates, fail to agree as to terms with the manufacturer from whom they got the original lot, and to fill their orders are obliged to obtain plates elsewhere; or, suppose that, instead of endeavoring to maintain the quality of plate indicated by their brand, they buy a cheaper article of inferior grade and send it out to their customers under the name which had heretofore indicated a fair quality. How stands the case then? Is not this obtaining money by false representations? To our mind there is something decidedly "wicked in such a practice." Such plans as these have been resorted to both by merchants in this country and by dealers on the other side. It is this part of the private brand business that should be stamped out.

Let us cite a case in point: A correspondent of one of our contemporaries writes as follows: "I am a sufferer from the disease under discussion. With your permission I will briefly state my experience. 'Being last year in want of a certain quality of tin plates to satisfy the steady demand of a certain class of my customers, after some difficulty I accepted the offer of a large and well-known firm of tin merchants to send me a few sample boxes, which being found to suit my customers, led to an order in bulk, which was soon cleared out, giving entire satisfaction. I then ordered the same brand, of the same firm, at a little advance in price, owing to the state of the market, which instead of being pronounced as the previous lot had been, all they desired, were denounced by the unanimous voice of my clients; and instead of being sold as they ought, and would have been nine months ago, had they been equal to the previous lot, part were disposed of at a sacrifice, and the remainder are still in my warehouse, to be got rid of as best I may—all remonstrance being unheeded under the specious plea 'that they are the same as the last.' The merchants with whom I dealt have thus sold their trade with me along with the tin I bought. I can no longer have confidence in any house that thus treats a customer."

Steam Service under the British and American Flags.—The statistics of British navigation, as compiled in the blue book for 1879, make an interesting showing. Since 1870 the British steam tonnage has increased from 1,111,375 to 2,508,102 tons. During the same period the sailing tonnage has decreased from 4,503,318 to 4,013,187 tons. This indicates a revolution in the ocean-carrying trade the end of which is not yet. Steam will undoubtedly supplant much of that trade which continues to be done by sailing vessels. England still takes more than her old lion's share of the world's commerce. While the amount of foreign tonnage entering and clearing at the ports of the United Kingdom since 1874 has barely held its own, that of Great Britain has increased about 84 per cent. The United States feel the effect of this peaceful British assertion of the supremacy of the seas. The clearances of steam shipping (nearly all of it British) from England to the United States rose from 1,445,000 tons in 1875 to 2,448,000 in 1879. Statistics of arrivals and clearances at the port of New York for the month of April put the same unpleasant fact in a more impressive way. The total arrivals for the month from all foreign ports were 110 British steamers to 21 American; and clearances, 102 British to 13 American. The American steamers here referred to trade exclusively with the West Indies, Mexico and South America. Not a single one of them made a trip between New York and a European port during the past month. England has a complete steam monopoly of the North Atlantic so far as New York is concerned. Her only competitor on this side is Philadelphia, with four steamers of the "American Line," as that city proudly calls it.

The St. Gothard Tunnel Accident.—A Geneva dispatch to the *London Times* says: By the explosion of the dynamite magazine belonging to the St. Gothard Railway contractors at Faido, on Saturday last, three persons were killed and 20 injured. Several of the injured are not expected to recover. The accident in the tunnel on the 6th inst., when a portion of the roof fell, will not seriously interrupt the work.

Labor troubles have recommenced in Great Britain, an attempt having been made to again reduce the wages of iron workers in the north of England. Is the proposed reduction in wages intended to meet the reduced price of iron in this country? If so, the good effect of paying living prices to workmen here is apparent. The iron workers who have struck have done so in spite of the fact that the reduction was authorized by a board of arbitrators—in other words, the arbitration attempted in this case has failed. But it has succeeded in averting strikes and lock-outs in hundreds of other cases, and the fact that it failed here raises the presumption that the workmen have some good reason for their course.



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The Iron Age

AND
Metallurgical Review.

New York, Thursday, May 20, 1880.

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Monthly Edition: \$1.25—£1=6¼ francs=5 marks=3 florins=1½ roubles (coin)=6¼ lire=5 pesetas.

REMITTANCES

should be made by draft, payable to the order of David Williams, on any banking house in the United States or Europe; or, when a draft cannot be obtained, in postage stamps of any country.

NEWSDEALERS OR BOOKSELLERS
In any part of the world may obtain *The Iron Age* through the American News Company, New York, U. S. A.; the Wilmer & Rogers News Company, New York, U. S. A.; and London, England; or the San Francisco News Co., San Francisco, California, U. S. A.

RATES OF ADVERTISING.

On square (12 lines, one inch), one insertion, \$2.00; one month, \$7.50; three months, \$15.00; six months one year, \$30.00; payable in advance.

WILLIAMS, Publisher,

83 Reade Street, New York.

PITTSBURGH . . . 77 Fourth Avenue
JOS. D. WEEKS, Manager and Associate Editor.
PHILADELPHIA . . . 220 South Fourth Street
THOS. HOBSON, Manager.

CINCINNATI . . . Builders' Exchange
T. T. MOORE, Manager.
CHATTANOOGA . . . Eighth and Market Streets
S. B. LOWE, Manager.

BRITISH AGENCY.

The publishers of *The Iron Age*, 40 Cannon Street, London, England, will receive orders for subscriptions and advertisements on our regular terms.

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The strong opposition manifested by so large a number of the members of the Western Nail Association against the reduction in the card on nails from \$4 to \$3.25, indicates that they, at least, believe that the bottom of the reduction in the prices of nails has been about reached. It is stated that the vote in favor of reducing prices stood 9 to 8, with several refusing to vote, though the vote of these might not have affected the result, as they would have voted, it is understood, in about the same ratio as the vote was announced. The arguments in favor of reduction were, it is stated, mainly that nails were selling by jobbers and speculators far below \$4, that the country were expecting a reduction to about \$3.25, and that consumers would not buy until the reduction was made. Against

this it was argued that they would not buy even at the reduction, and that speculators and jobbers would continue to undersell. So far as we can learn at the present writing, the latter were correct. Trade has not been stimulated, and speculators are offering what few nails they have left below the \$3.25 card. One thing may be taken for granted by the nail men; they will not get trade on a legitimate basis and begin to receive orders until they allow these stocks of cheap nails to get out of the way, and show the country that they do not propose to go lower.

Congress and the Tariff.

Congress has kept the country more or less excited for about half a year on the subject of tariff revision, and is now about to adjourn without having made so much as a serious attempt to change that instrument in any essential particular. We are not surprised at this; but no one who considers the subject intelligently from a business standpoint can fail to regret that the obvious unwillingness of the House of Representatives to do anything was not allowed to find definite expression in a resolution which would have expressed the real feeling of that body, and, at the same time, have quieted the anxiety to which the constant and wholly insincere talk about tariff revision has given rise. No doubt there are some members of the House, and especially of the Ways and Means Committee, who believed that it was both possible and desirable to secure the passage of certain important bills reducing duties, and our well-informed Washington correspondent, whose letter is elsewhere printed, states that Mr. Tucker and Mr. Morrison are still of this opinion. It requires no especially intimate knowledge of matters at the capital, however, to see that a majority of Congress does not expect or desire that any action shall be taken this year, and this might as well have been distinctly stated three or four months ago as not. Even among those who are generally favorable to a careful and judicious revision of the tariff, all but a few unreasonable enthusiasts see that the Committee of Ways and Means is not equipped for this work, and that anything which comes from them will be as unsatisfactory and as much open to objection as the tariff as it stands.

Tariff tinkering is a very different thing from intelligent and comprehensive tariff revision. The latter we can never have until the work is intrusted to a qualified commission of experts appointed from civil life, who can give the subject that careful study which its importance demands, and, by equalizing and simplifying the rates of duty with intelligent reference to the conditions and requirements of the industries and trades affected, remove all reasonable objections to the tariff without abandoning the essential principle of protection to American industry. Those who think we can with advantage—or, at least, without injury—dispense with protection, belong to a class of doctrinaires whose views are entitled to very little consideration. Either they are ignorant of the conditions existing here and abroad, or they are actuated by a desire to promote selfish interests, which they think can best be promoted by the destruction of so much of our industrial system as free trade would ruin. By dallying with these questions and refusing to commit itself to a definite expression of the views and intentions of the majority, Congress betrays the business interests of the country. That it adjourns from year to year without important action, does not excuse the perpetual menace of action, with its disquieting influence upon our productive and distributive industries. The man who flourishes a pistol in the face of another may do him serious harm, even though the pistol is not loaded, or, being loaded, is not intended to be discharged. Session after session a noisy little minority make the country uneasy by breathing out threatenings and slaughter against protection. Session after session ends and protection still stands. How much better to give the country the assurance that the conservative majority of the Senate and House are opposed to any sweeping change, and that no hasty or ill-considered action will be taken on any question affecting our industrial system. But probably this is more than we can expect of Congress.

Information elsewhere given in our columns with regard to the awards of honors to American exhibitors at the Sydney (N. S. W.) Exhibition, show that our manufacturers have won another conspicuous success in that important corner of the world. Since the Centennial our manufacturers have entered these international contests with spirit and enthusiasm, and in every instance—except, perhaps, at Vienna—they have appeared to conspicuous advantage. This is not at all surprising. There is something about American products which command attention wherever they are seen. They are not, as the rule, so cheap as competing products of Great Britain, but there is something about them which British goods do not have. Even when no better in quality, they command approval because of their ingenuity, their shapeliness or their perfect adaptation to the uses for which they are intended. In a new country like Australia there are so many conditions similar to those which exist in our own country, that it is not to be wondered at that our manufacturers have won hearty approval. Such communities are not hampered by tradi-

tions. The usage of generations does not commend to the people of that country, any more than to our own people, tools and implements which lack something of perfect adaptation to the requirements of those who use them. Where labor is scarce and high priced, it is best economized by machinery, tools and appliances which give the best results with the least expenditure of effort.

Manufacturing Statistics in the Census of 1880.

The special schedules of manufactures for the coming census enumeration are twelve in number. What is known as the schedule of manufactures proper excludes boot and shoe factories, cheese and butter factories, flouring and grist mills, salt works, lumber mills and saw mills, brick yards and tile works, paper mills, coal mines, agricultural implement works and quarries, which will be reported on a special manufacturing schedule. In the general schedule of manufactures the term "productive industry" is used to denote not only all factories and large works, but also the mechanical trades, as blacksmithing, carpentering and coopering. Every shop is to be included the production of which is \$500 annually, including cost of materials, and the kind of business is to be described specifically. The questions are as to the name of the corporation, company or individual; the name of the business, manufacture or product; the capital invested, the greatest number of hands employed at any one time during the year, the average number of hands employed, including males above sixteen years, females above fifteen years and children and youth; the number of hours of ordinary daily labor from May to November and November to May; the average day's wages for skilled mechanics and ordinary laborers; the amount paid in wages during the year the months in operation on full time, three-quarters time and two-thirds time, and the number of months of idleness; the value of material, including mill supplies and fuel; the value of product, including jobbing and repairing; the kind and amount of power used, whether water or steam, with a description of the streams or the number of boilers and engines. The value in horsepower of the water and steam power is considered a matter of great importance, as are the inquiries with regard to the value of material and the value of product. The cost of superintendence, rent, freight of goods to market and other general expenses of a manufacturing establishment are not to be included in materials. Mill supplies and fuel are included. The value of the product, in the case of mills and factories producing for a distant market, means the wholesale price of the goods. In the case of small shops producing goods or doing work for the neighborhood only, the value of the product means the price charged at the shop.

The twelve special schedules above mentioned are amplifications of the schedule of manufactures above outlined. The schedule of agricultural implements contains, in addition to the questions in the principal schedule, questions as to the total value of all materials, the seeders and planters, implements of cultivation, harvesting implements, seed separators and miscellaneous implements produced, with the total value of all the products. The additional questions in respect to paper mills are with regard to tub and other engines, paper machines, materials and products, with their total value. The additional questions with regard to boots and shoes are as to the materials used, the products and their total value, and the tanning and currying of leather by persons or companies engaged in that business. The special questions with regard to lumber mills and saw mills are as to the saws, materials, the proper saw mill products, remanufactures, the system of logging, the shipping and the total value of products and remanufactures. The special questions affecting brick yards and tile works are as to materials and products. The additional questions with regard to flour and grist mills are as to the maximum daily capacity, custom work or market work, the use of elevators, the total value of all materials and the amount and total value of all products. The additional questions concerning cheese factories, butter factories, combined butter and skim cheese factories and condensed milk factories are divided into questions applicable to all the factories, and questions applicable to each particular kind of factory, following the plan of other special questions. The special questions as to slaughtering and meat packing call for the number and value of all animals killed, and the value of fresh, salt and cured meats and other products. With regard to salt works, the additional questions are as to the production of salt by boiling and by solar evaporation, and the amount and value of the product. The two final special schedules concern small coal mines and quarries. The special questions with regard to coal mines relate to the kind of coal mined, the cause of any fires, the principal market, mode of transportation, accidents to persons during the year, maximum capacity, dimensions of mine, machines used, amount and value of products. The questions as to quarries are the same as those concerning coal mines, excepting, of course, as to the nature of the product and the danger from fire.

The statistics thus gathered will be of the greatest interest and value, and manufacturers of all classes should feel a direct and personal interest in giving the enumerators

the fullest and most exact information possible. The arrangements made for the collection and tabulation of the statistics of iron and steel insure completeness and accuracy, but it is to be feared that our manufacturing industries in general are not likely to be so well attended to. In any case, the success of the work depends upon the intelligent co-operation of our manufacturers, and we hope this will be given in every case.

The Manufacture of Steel in Great Britain.

Mr. J. S. Jeans, Secretary of the British Iron Trade Association, in a report just published of the statistics of the British iron and steel trade for 1879, furnishes figures which will be read with interest. The returns from the Bessemer steel works, which are stated to be complete, show the following as the number of establishments working, the number of converters used by them, the production of ingots and of rails:

District.	No. of works operative.	No. of Bessemer converters at work.	Production of ingots, tons.	Production of rails, tons.
Sheffield	7	22	210,346	82,774
South Wales	4	15	252,573	189,503
Lancashire	4	14	152,139	73,870
Cumberland	2	7	127,163	103,959
Nor. E. Coast	3	6	85,299	69,255
Staffordshire	1	3	7,200	860
Total	20	66	834,711	520,231

What is most remarkable in these figures is that only a part of the ingot capacity of the works in operation is devoted to the manufacture of steel rails. It may be of interest to ascertain, approximately at least, what proportion of the steel made in England in 1879 has been rolled into rails, and about how much has been turned over for other purposes. If we assume that the wastage, &c., in making rails is about equal in this country and England, it would require 120 tons of ingots to produce 100 tons of finished steel rails. At this rate 520,000 tons of steel rails would call for 625,000 tons of ingots, thus leaving about 200,000 tons of ingots which were used in Great Britain for other purposes. We know that during 1879 little or no English steel was shipped to this country in the shape of blooms, and are forced to the conclusion that fully one-fourth of the Bessemer steel made in England is consumed in the manufacture of articles for which that material has not yet become available in this country. This movement is one of recent origin, its strength never having been so decidedly revealed before. In 1878, 622,390 tons of rails were made from 807,527 tons of ingots, leaving a small quantity for general purposes. The abandonment of the rail trade on the part of some Bessemer mills is significant, and we need only glance over the table given in the above to find indications of the direction in which this material is now flowing. It will be noticed at once that Sheffield, while it produced 210,346 tons of ingots, did not turn out more than 82,774 tons of rails. At least 100,000 tons of metal have been used in other trades of that district, and even after deducting a fair allowance for ship and armor plates, guns and other war material, a very large amount remains as probably consumed by cutlery manufacturers. For cheaper grades of goods no metal is probably more suitable than the best grades of Bessemer steel, and it is likely that free use of it on the part of Sheffield firms will give them an important advantage over their rivals in other countries. American manufacturers will, probably, in the near future, be obliged to give this matter more serious attention.

When compared to that of the United States, the production of steel in Great Britain has ceased to be so formidable. Our Bessemer works turned out during the year 1879, 829,439 gross tons of ingots, against 834,711 for Great Britain, so that we have very nearly reached their output. It is a remarkable fact, highly flattering to Americans, that this product was achieved with only twenty-two converters, while it took sixty-six English vessels to do the same amount of work. As far as the production of steel rails is concerned, America now stands unrivalled, having turned out 610,682 tons, against 520,231 tons made in England. While we are adding to our plant ten additional converters, eleven new vessels are being built in England, eight of which are in the Cleveland district, thus swelling the total number of converters in Great Britain to 115.

Little progress is being made in England in the production of open-hearth steel, the output in 1878 having been 176,000 tons, while in 1879 it was 175,000. The following table gives the details:

District.	Number of hearth furnaces erected.	Production of steel in 1879, tons.
South Wales	48	85,000
Scotland	16	30,000
Sheffield	15	21,000
Lancashire and Cheshire	12	15,000
Northeast Coast	one	1,000
Other districts	—	3,000
Totals	109	175,000

We may add, in conclusion, that the United States turned out during the year 1879 about 50,000 tons of open-hearth steel, the capacity in this country being still very considerably inferior to that of Great Britain, though probably growing more rapidly.

The Duty on Steel Rails in France.

While in this country, the campaign of those interested in the importation of steel rails against the present duty has proved a failure, the efforts of the free traders have been much more successful in France. More than a year since a committee was appointed by the Chamber of Deputies to inquire into the status of the various industries of France, and to report upon the feasibility of readjusting the tariff. This committee heard a vast amount of evidence, and after long and mature deliberation made a report in which was embodied a recommendation to reduce the duty on steel rails from 90 francs per ton, as now in force, to 75 francs per ton. The government pleaded for a further reduction to 60 francs, and has succeeded in obtaining the support of the Chamber of Deputies, who, disregarding the conclusions reached by its special committee, voted for the government measure. On the other hand, an amendment introduced by M. Sourigues to place the figure at 25 francs was rejected. In view of the exceptionally difficult position in which the French steel industry is placed as regards its capacity for resisting foreign competition, there is much hardship in this turn of affairs. For their supplies of pure ore and good fuel, French steel makers are forced to buy largely in foreign markets, and to transport raw materials for great distances, so that even when protected, as they have been hitherto, the return realized for the investment of capital was low even for France.

The action of the government will place them in a precarious position. The enormous capital invested in the mills producing steel rails, and many other circumstances, render the choice between two extremes only possible. Steel rail mills cannot reduce their output temporarily, or adapt themselves as readily to a change of circumstances as the smaller establishments in other branches of manufacture or the older iron works. As ponderous and intricate a business as that can only work profitably when operating at full capacity. Stoppage or curtailment means ruin. In this respect, the position of the French mills differs little from that of such works elsewhere. They cannot, however, seek an outlet in other markets, and when once their own field is invaded by others, little else remains but to go to the wall. With such formidable and favored rivals as England, Germany and Belgium at its very doors, each of them capable of expanding at short notice so as to meet orders likely to come to them from France, it is not astonishing that steel makers in the latter country are deeply disappointed with the course of affairs. They have shown in vain that unless an opportunity of steady and remunerative employment is offered to them by the retention of the rail trade, they will be incapable of meeting the requirements of the government for war materials in the hour of need, an argument the force of which those can appreciate who have watched the eager interest generally taken by Continental governments in all matters likely to affect their military standing. It does not, however, appear to have been strong enough to prevent the representatives of the Chamber of Deputies from dealing a severe blow to the French steel industry. We shall closely follow the results of the policy thus initiated by the government, as its results are likely to present many features which may serve as a warning to American legislators.

Mexico and the West Coast.

In prospect of an early completion of important railway connections in the South, San Francisco is stirring herself to secure a larger share of Mexican trade. She is giving special attention to measures calculated to offset the advantages of which the English and Germans are already possessed in that country, and asks from the Mexican government bonded warehouse facilities. At a recent meeting of the San Francisco Board of Trade, it was stated that American merchants experience much embarrassment from the lack of enterprise in Mexico, business facilities being exceedingly poor in the absence of means of transportation and the insecurity of goods after their arrival in that country. The principal want is a bonded warehouse system, which would prove an enormous advantage if the Mexican government could be induced to adopt it. President Diaz is believed to favor the project. A memorial to the Mexican Congress on this subject would probably be well received. The greatest obstacle to be encountered would proceed from the European merchants, who hold the bulk of the trade and extend long credits. It was also proposed to memorialize our own government, urging that reciprocity with Mexico should be established. It was very singular, one of the speakers remarked, that a piece of cotton cloth made in Lowell, and sent first to England or Germany, could be sold to the Mexicans cheaper than if exported direct. Another member of the board had heard the President of Guatemala express himself in favor of reciprocity for Central America, where trade has increased 100 per cent. during the last year, and all along the coast trade was vastly improving. Merchants from the West Coast are now in San Francisco inquiring for steamers. Shipments of coffee had commenced and promised a considerable development, and, in exchange, California wines, beer, flour, agricultural implements, sewing machines and the like were much wanted. But in the absence of bonds

warehouses small capitalists could not do importing business there, because the duty was often more than the first cost of the merchandise. More mines are being opened there than ever before, creating demands for mining machinery and implements.

The result of the discussion was the appointment of a committee to memorialize the Mexican government. Undoubtedly the railway connections soon to be completed in the direction of Central America and Mexico are destined to work great changes in the trade of the West Coast, in which steam navigation will play an important part. The growing abundance of money will aid in the extension of credits, so essential to success in competing with Europe.

Our Foreign Trade in 1879 and 1878.

The Bureau of Statistics at Washington has just published particulars of our trade with the various foreign countries during the calendar year 1879 as compared with 1878. We have prepared therefrom a few tables showing the domestic export and the import only, suppressing the foreign export, which amounted to only \$10,503,070 last year and to \$13,805,252 in 1878, since it would have rendered our statistics altogether too unwieldy.

We have reduced everything to millions of dollars and decimal fractions:

AMERICA.	Export.		Import.	
	1879.	1878.	1879.	1878.
Argentine Republic.....	2.16	1.63	3.49	4.59
Brazil.....	8.58	8.72	46.59	40.72
Central America.....	1.33	1.17	2.99	3.11
Chile.....	1.02	1.37	0.63	0.60
Danish West Indies.....	0.77	0.79	0.35	0.48
French West Indies.....	1.65	1.55	2.24	2.96
French Guiana.....	0.01	0.01	0.01	0.01
Haiti.....	0.88	0.31	0.01	0.01
Nova Scotia, N. Bruns- wick and P. E. Islands	2.81	3.48	3.84	3.56
Quebec, Ontario, Mani- toba and N. W. Ter.	20.67	23.37	23.25	20.65
British Columbia.....	1.97	1.38	0.97	0.89
Newfoundland and Labrador.....	1.27	1.10	0.30	0.29
British West Indies.....	0.31	0.21	3.09	4.54
British Guiana.....	1.56	1.93	0.82	0.75
British Honduras.....	0.29	0.01	0.27	0.01
Haiti.....	3.16	3.49	3.26	2.99
Mexico.....	5.69	5.38	6.09	5.80
Dutch West Indies.....	0.57	0.58	0.84	0.67
Dutch Guiana.....	0.21	0.01	0.23	0.01
Peru.....	1.17	1.39	0.77	0.31
St. Domingo.....	0.74	0.65	0.46	0.40
Cuba.....	11.41	11.43	57.91	60.44
Porto Rico.....	1.97	1.64	4.15	4.63
Colombia.....	5.26	4.76	6.91	5.36
Uruguay.....	0.84	1.87	2.33	2.17
Venezuela.....	2.13	2.38	5.31	6.23
Totals.....	83.64	89.61	177.44	174.09

EUROPE.	Export.		Import.	
	1879.	1878.	1879.	1878.
Austria.....	2.38	2.54	0.35	0.25
Belgium.....	31.03	27.74	6.35	3.53
Denmark.....	2.74	2.47	0.10	0.01
Iceland.....	0.01	0.01	0.01	0.01
France.....	92.75	78.81	36.27	45.27
Germany.....	50.73	58.40	40.46	34.53
England.....	117.03	107.62	130.62	92.39
Scotland.....	26.56	23.82	11.37	8.39
Ireland.....	37.45	58.47	2.47	2.19
Gibraltar.....	1.98	1.62	0.01	0.01
Greece.....	0.15	0.93	0.55	0.41
Italy.....	9.94	8.80	8.18	6.41
Holland.....	15.49	13.21	3.88	3.09
Portugal.....	4.75	4.05	0.56	0.41
Russia, Baltic.....	14.37	14.25	0.23	0.31
Russia, Black Sea.....	0.95	0.27	0.18	0.01
Spain.....	14.05	18.86	4.26	3.21
Scandinavia.....	2.15	2.99	0.35	0.25
European Turkey.....	2.68	2.84	0.01	0.01
Totals.....	647.16	613.75	267.05	200.85

ASIA AND OCEANIA.	Export.		Import.	
	1879.	1878.	1879.	1878.
China.....	2.23	3.04	20.06	16.74
British India.....	2.46	0.21	14.74	10.36
Hong Kong.....	3.23	3.31	0.92	1.71
Australasia.....	5.17	7.13	0.79	1.39
Other British Islands.....	0.19	0.19	0.11	0.11
Sandwich Islands.....	2.11	1.80	3.54	3.24
Japan.....	2.50	3.23	14.50	8.85
Dutch East Indies.....	2.35	2.40	4.55	1.00
Asiatic Russia.....	0.01	0.01	0.01	0.01
Philippine Islands.....	0.01	0.01	5.57	6.50
Asiatic Turkey.....	0.28	0.41	0.54	0.28
Totals.....	19.47	21.28	66.40	54.24

AFRICA.	Export.		Import.	
	1879.	1878.	1879.	1878.
Algeria.....	0.58	0.71	0.38	0.38
Cape.....	1.99	2.09	1.11	0.87
Portuguese possessions.....	0.45	0.38	0.12	0.01
Tunis and Egypt.....	0.45	0.34	0.10	0.16
Other countries.....	0.86	0.61	1.14	1.27
Totals.....	4.39	4.38	2.85	2.63

RECAPITULATION.	Export.		Import.	
	1879.	1878.	1879.	1878.
Europe.....	647.16	613.75	267.05	200.85
Asia and Oceania.....	19.47	21.28	66.40	54.24
Africa.....	4.39	4.38	2.85	2.63
Totals.....	754.66	759.08	335.74	317.81

GREAT BRITAIN AND HER COLONIES ALONE.	Export.		Import.	
	1879.	1878.	1879.	1878.
Nova Scotia, &c.....	2.81	3.48	3.84	3.56
Quebec, &c.....	20.67	23.37	23.25	20.65
British Columbia.....	1.97	1.38	0.97	0.89
Newfoundland and Lab- rador.....	1.27	1.10	0.30	0.29
British West Indies.....	0.31	0.21	3.09	4.54
British Guiana.....	1.56	1.93	0.82	0.75
British Honduras.....	0.29	0.01	0.27	0.01
England.....	317.03	307.62	130.62	92.39
Scotland.....	26.56	23.82	11.37	8.39
Ireland.....	37.45	58.47	2.47	2.19
Gibraltar.....	1.98	1.62	0.01	0.01
British India.....	14.05	0.99	14.74	10.36
Hong Kong.....	3.23	3.31	0.92	1.71
Australasia.....	5.17	7.13	0.79	1.39
Other Brit. As. Islands.....	0.19	0.19	0.11	0.11
Cape.....	1.99	2.09	1.11	0.87
Totals.....	450.05	430.61	196.55	148.28

The recapitulation shows a remarkable increase in our European trade, while the export to American and Asiatic countries has slightly decreased, our import thence showing some increase. The total domestic export and the import in 1879 was \$1,268,400,000, and in 1878, \$1,160,830,000. Another table shows the share which Great Britain and her colonies alone had in this trade, being \$646,600,000, or 51 per cent., in 1879, and \$587,890,000, or about 50 per cent., in 1878. This demonstrates both the magnitude and the steadiness of our British trade, which expands with the general movement.

After gathering a good deal of evidence on the best means of preventing smoke from locomotives with due economy of coal, a committee of the American Master Mechanics' Association, consisting of E. T. Jeffrey, H. A. Towne and Sanford Keeler, has reached the conclusion that large boilers and fire-boxes and careful firing, are the points which ought to be principally considered.

The British Board of Trade Returns.

No statistical data are likely to be studied with such eager interest at the present time by iron-masters as the returns published monthly by the British Board of Trade. To many, probably, the figures which we present below will be disappointing, as they have undoubtedly expected to see the decisive action of our manufacturers in meeting foreign competition by successive reductions of prices, reflected in the April shipments of iron and steel from England to this country. As will be seen, this has certainly not been the case; on the contrary, a strong increase is noticeable in a number of important articles, swelling the total to unprecedented figures. The following are the returns for the month of April, 1879 and 1880, and the four months of both years ending May 1:

Articles.	April.		Four months.	
	1879.	1880.	1879.	1880.
Pig iron.....	4,597	135,724	14,589	368,247
Old iron.....	4,077	39,109	13,578	138,571
Steel, unwrought.....	530	7,627	1,962	18,752
Hoops and sheets.....	122	5,585	357	30,006
Bar, angle, bolts and rods.....	243	9,536	938	33,353
Iron rails.....	13,727	1,184	64,169	
Steel rails.....	7,075			
Total.....	7,869	218,383	22,828	643,108

In order to illustrate clearly how great and how sudden has been the increase during the period which has elapsed since the revival in September, we have tabulated the shipments since that month:

Articles.	April.		May.	
	1879.	1880.	1879.	1880.
Pig iron.....	8,491	6,479	4,300	5,570
Old iron.....	2,311	4,691	2,692	6,651
Steel, unwrought.....	1,641	4,081	2,492	5,659
Hoops and sheets.....	721	2,487	2,968	4,057
Bar, angle, bolts and rods.....	2,242	3,678	4,985	6,819
Iron rails.....	9,277	7,344	13,201	12,790
Steel rails.....	6,882		12,201	
Total.....	38,944	99,484		

Adding up the totals we reach the following result, which is well calculated to startle American iron-masters. We have not, however, included in these statements the shipments of tin plates, as these cannot fairly be regarded as affecting the American iron trade, though they are naturally important to English producers of iron.

Articles.	October 1 to May 1.	
	1879-80.	1878-79.
Pig iron.....	27,868	568,602
Old iron.....	4,391	235,764
Steel, unwrought.....	3,349	23,797
Hoops and sheets.....	668	27,449
Bar, angle, bolt and rod.....	1,828	51,703
Rails, iron and steel.....	1,412	86,778
Total.....	38,944	994,084

Since the revival, therefore, almost a million tons of iron and steel have been shipped from England to this country, against about 40,000 tons during a similar period a year ago. It should not be forgotten that though in many articles like pig, hoops, bars, &c., this will represent very nearly the total sent here, it shows only a part of shipments in others. We believe that we are not very far from the truth when we state that during the seven months referred to, as much as 100,000 tons of old and scrap iron have reached us from other sources. These facts will render it obvious to even those who have a superficial knowledge of the iron trade of this country, that the action of home manufacturers has been none too early or none too decisive, and this view is fully borne out by the figures presented, which speak so eloquently for themselves that it is unnecessary to enter into details. We may conclude by casting a rapid glance at the shipments of Great Britain to other countries, our first two columns giving the total shipments to all countries, including the United States, and the second two those excluding this country, for the month of April in 1879 and 1880:

Articles.	To all Countries.		To all except U. S.	
	1879.	1880.	1879.	1880.
Pig iron.....	114,572	231,155	109,675	95,431
Old iron.....	4,431	40,415	2,174	1,306
Steel unwrought.....	5,285	9,770	1,755	2,143
Hoops and sheets.....	15,380	29,980	15,258	18,355
Bar, &c.....	15,548	34,777	15,305	25,041
Iron rails.....	3,750	16,804	3,750	3,077
Steel rails.....	25,401	45,287	25,401	38,212

From this table it is evident that when the supplies which are being unloaded in this country are deducted from the total shipments made from Great Britain, little that

looks like a substantial improvement in its regular foreign markets remains. In a number of articles like steel rails, Canada has become a good customer for the time being, but, on the whole, it is but too evident that as soon as this market is closed against English iron, British ironmasters will be little better off than they were a year ago. The present low prices will naturally have the result to stimulate buying on the part of many foreign consumers who were not in a position to enter a market which had been bolstered up by wild speculation. As yet, little of this prospective relief is apparent, but it is largely to it that the English and, to a certain extent, the American iron trade also must look for help.

As stated in our column of Labor and Wages, the strike in the Connellsville coke region is over, and the men have resumed work at the reduction offered by the operators. The latter, however, find another and even more serious trouble confronting them—a largely increased production and a decreasing demand. The causes of this state of affairs are outlined in our editorial of last week. The heavy reduction in the price of coke seems to have had the same effect as similar reductions in iron—to kill off what little business was doing. The Coke Association are now looking around for some way out of their troubles. It is reported that, at a meeting held last week, it was decided to make 72-hour coke instead of 48-hour, as is the rule at present, 72-hour being made only as "Sunday coke." The 72-hour coke is so called from the time it is allowed to remain in the ovens, and is firmer and better than either 48-hour or 24-hour coke. It is hoped by the operators that this plan of making only 72-hour coke will bring the supply down to the demand; but some have no faith in the remedy, and are not running their ovens, or are running but a part of them. It is stated that if this plan does not succeed an arrangement will be made to reduce the number of ovens running. In the meantime a large number of enterprises that have been contemplated, and some even that have been undertaken, are at a standstill. Such a large number of blast furnaces have gone out of blast that there is not demand enough for the ovens that are now built, much less for the large number that were in progress. Some of these new enterprises will be pushed to completion. They are undertaken by parties who own or control furnaces and can supply a market for the make.

As some of the troubles with ironworkers in the East are settled, others seem about to begin. The rates now paid for puddling average from \$3.50 to \$4.50, and, if the depression continues, still lower rates will probably have to be accepted. There is one feature in these strikes for the past few months that must not be overlooked, as it promises to have more or less influence on those of the immediate future. There is no doubt that unionism is growing in the iron mills East. It exists among the iron workers to an extent that the manufacturers will scarcely credit, but if they will investigate they will learn somewhat of its extent, and from the acts of the past few months can judge of its intentions. These can be seen on the surface. The strike in middle Pennsylvania of last March was a union strike; so was the one at E. & G. Brooke's mill, as also at half a dozen other places in Eastern Pennsylvania of which we do not now recall the names. The one at Richmond that has just ended was not only a union strike, but virtually for recognition. The one at Catasauqua is to "scotch" the union in its incipient state, the union having been organized in a mill that was idle for months by reason of a fight against the union. If indications are to be believed the union is growing in the East, and in future struggles over the wages question its strength must be considered as a factor in determining that result.

Port Henry Ores—Wetherbees, Sherman & Co., Port Henry, N. Y., in a circular issued May 10, but received too late for notice last week, say: "Recognizing the decline in iron, and wishing to meet our customers in a liberal spirit, we have concluded in lieu of the discount of 50 cents per ton, as per our circular of March 10, 1880, to make that discount \$1.50 per ton, to take effect May 1, 1880, until further notice. We reserve the right to advance prices at any time during the season. All sales subject to the terms of our season's circular."

The McDonald furnace shield, which was illustrated on the first page of *The Iron Age* of December 25, 1879, is meeting with decided favor among the ironworkers of the West. At a meeting of the Amalgamated Association of Iron Workers at Pittsburgh last week, a letter was read from a number of puddlers, which says: "We find that with this shield protecting us we are able, with only one helper, to do better work—that is, to make better iron and to produce a better yield in the hottest days of July and August than used to be possible, even with a third man, and we do not experience that feeling of entire exhaustion that generally follows a hot day's work in front of a furnace, and which is such a drain on a man's constitution and vitality, because our exposure to the heat has been reduced to the minimum, and we are therefore enabled to work in comparative comfort." The following resolution was adopted after the communication was read: "Resolved, That the ironworkers of the First District pledge themselves to use all honorable means to have shields adopted and used in the First

District, and that we urge our conference committee to advocate and urge its adoption." Of the great value of this invention there can be no doubt. Puddling and heating are the severest labor at a rolling mill, and anything that will lessen this labor should be gladly adopted by mill owners. Mr. H. McDonald, of the Sligo Mills, Pittsburgh, Pa., is the inventor.

Tariff Matters at Washington.

(From Our Own Correspondent.)

WASHINGTON, D. C., May 19, 1880. Representative Tucker, who has charge of the hoop iron bill, in conversation to-day stated that it was his intention to insist upon action on this measure before the adjournment of Congress, whether it should come early or late. He stated that whatever action Congress might take in the matter he wished to have this question disposed of, as he is in receipt of a large number of letters from New York, in which the importers urge the necessity of action, as they are able to enjoy the benefits of a limited time for the admission of the hoop iron contracted for prior to March 12 they will suffer great losses.

The hoop iron interest represented here, and by correspondence from the large manufacturing centers, urge their friends to have the bill acted upon in some shape, in order to put a stop to the uncertainties of trade growing out of the incessant agitation of the question of duties. There is no doubt that the minority report submitted by Gen. Garfield on this question has had an important influence upon the members of the House who hitherto were disposed to follow the leadership of the majority of the Committee of Ways and Means.

The lucid manner in which Gen. Garfield presented the views of the minority and brought out the general theory of the imposition of duties on imported articles, has given rise to a much more philosophical view of this question, and Mr. Tucker has been advised by his friends not to press his measure too hastily, as should he persist in such a course it will be necessary to call a halt upon him, either by laying the whole question on the table or postponing action until the next session of Congress.

The following is a schedule of the present and proposed duties, and the equivalent ad valorem rates and the revenue for the fiscal year ended June 30, 1879, upon certain articles in schedule "L" of the existing tariff:

	Articles.	
Upon all other articles not herein otherwise specified, named in schedule L of said section and title of the revised Statutes, a duty of 40 per cent. ad valorem.....		8
Upon steel railway bars, 1 cent per pound.....		
Upon locomotive tires and parts thereof, 1 cent per pound.....		
Upon anchors or parts thereof, 1½ cents per pound.....		
Upon anvils, 1½ cents per pound.....		
Upon iron cables or cable chains or parts thereof, 1½ cents per pound.....		
Upon chains, trace chains, halter chains, and fence chains made of wire or rods not less than a quarter of an inch in diameter, 1½ cents per pound.....		
Less than one-quarter of an inch in diameter and not under No. 9 wire gauge, ¾ cents per pound; under No. 9 wire gauge, 30 per cent. ad valorem.....		
Upon horseshoe nails, 2½ cents per pound.....		
Upon bed-screws, wrought-iron hinges, wrought nails, spikes, rivets and bolts, 2 cents per pound.....		
Upon mill irons and mill cranks of wrought iron and wrought iron for ships, steam engines and locomotives or parts thereof weighing each 25 pounds or more, 30 per cent. ad valorem—2 cents per pound.....		
Upon blacksmiths' hammers and sledges, all hand-saws and back-saws of all descriptions, all files, file-blanks, rasps and floats of all descriptions, needles for knitting or sewing machines, all cutlery, other than pen knives, jack knives and pocket knives of all kinds, 25 per cent. ad valorem.....		
Upon plows, harrows, spades, shovels, hoes, mattocks, axes, scythes, hatchets and other like articles of iron or steel in a component material, used in agricultural, mining or mechanical purposes, 25 per cent. ad valorem.....		

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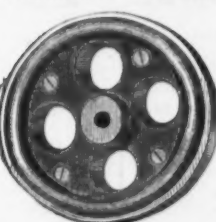
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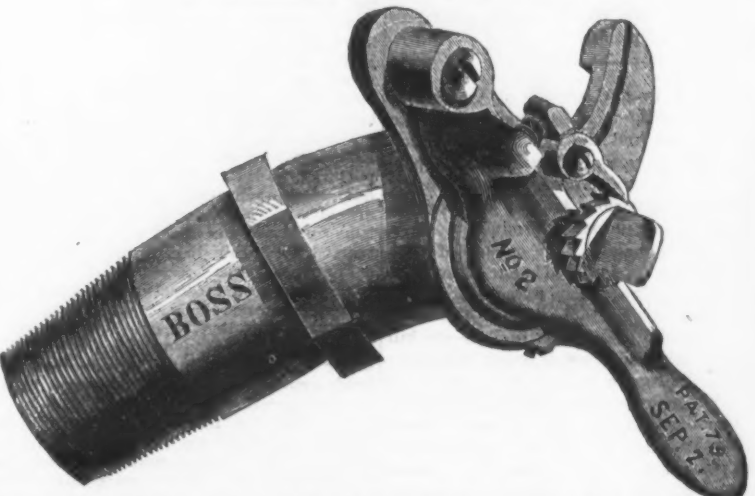
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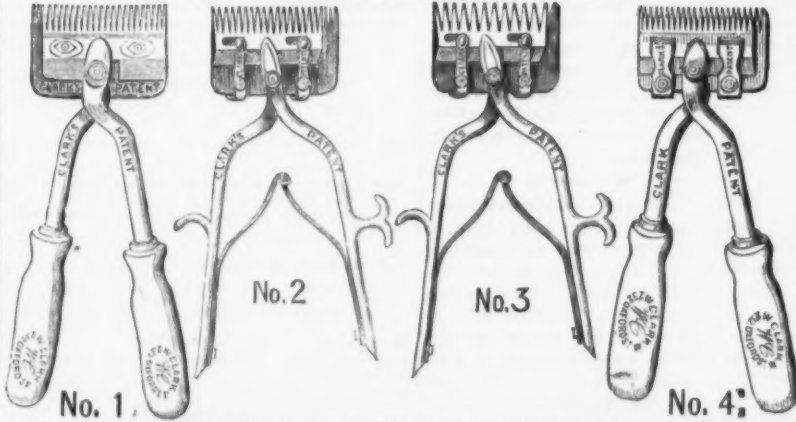
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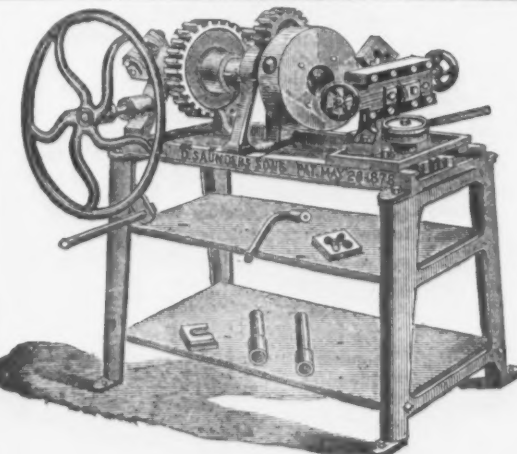
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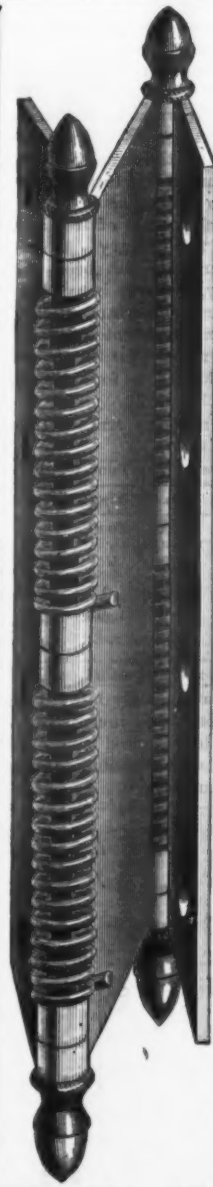
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3 ".....	8 30	11 50	13 50	17 00
5 ".....	16 50	21 00	21 50	26 00
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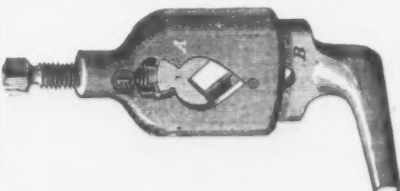
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ANNUAL MEETING OF THE British Iron and Steel Institute.

From the papers thus far received it does not appear that the meeting of the British Iron and Steel Institute on the 5th, 6th and 7th inst. has brought forward as much of interest to ironmasters and metallurgists as they have been accustomed to look for of late. We shall in the course of our report briefly state the contents of those which are of a more strictly scientific character, while we shall give those likely to be of practical value to American ironmasters at greater length. To us the following, by Arthur Willis, F. C. S., of the Landore Siemens Steel Works, Swansea, appears to be one of the most important:

ON THE REACTIONS IN THE OPEN-HEARTH PROCESS.

Steel from the open-hearth furnaces, as is well known, can be produced either from—
1. A mixture of pig iron and scrap.
2. Pig iron and iron ore without any scrap.

3. Pig iron, scrap and iron ore.
All these methods can be employed with advantage, but the most usual is the third—not that there is any special need to use scrap, but because it utilizes all scrap produced during the different stages of manufacture. In the Bessemer process carbon, silicon and manganese appear to be eliminated uniformly. In the open-hearth process the degree and the time of elimination are quite different. During the time the charge is passing into the fluid state, carbon, silicon and manganese are all more or less oxidized, about 50 per cent. of the total amount contained in the charge, varying slightly with the temperature of the furnace. As soon as the whole of the charge is fluid, the carbon remains almost, if not entirely, stationary, until the whole of the silicon and manganese are oxidized, which process takes from three to four hours. During the time occupied by the oxidation of the silicon and the manganese—no gas being given off—the metal in the bath remains tranquil. When the silicon is reduced to about 0.02 per cent., and the manganese has disappeared entirely, the oxidation of carbon commences, and the evolution of carbonic oxide throws the metal into violent ebullition, described by the melters as "being on the boil." This ebullition continues more or less until the carbon is reduced to 0.10 per cent. or under, when the metal becomes perfectly quiet, and the slag, which half an hour previously had been of a brownish tinge, begins to blacken from a slight oxidation of the metal.

From a number of analyses referring to the oxidation of carbon, silicon and manganese during the different periods of the process, I have selected two. No. 1 was an ordinary pig and ore charge with about 25 per cent. of scrap. No. 2 was a similar charge as far as composition was concerned, but after the pig and scrap were melted sufficient spiegelisen was added to give by calculation 1.5 per cent. manganese. Samples of the metal in each case were taken every half hour and carefully analysed, with the following results:

No. 1.	No. 2.	No. 1.	No. 2.
Carbon.	Silicon.	Carbon.	Silicon.
Per cent.	Per cent.	Per cent.	Per cent.
1.00	1.00	1.00	1.00
0.90	0.90	0.90	0.90
0.80	0.80	0.80	0.80
0.70	0.70	0.70	0.70
0.60	0.60	0.60	0.60
0.50	0.50	0.50	0.50
0.40	0.40	0.40	0.40
0.30	0.30	0.30	0.30
0.20	0.20	0.20	0.20
0.10	0.10	0.10	0.10
0.05	0.05	0.05	0.05
0.02	0.02	0.02	0.02
0.01	0.01	0.01	0.01

When pure ore is used, no appreciable alteration takes place in the percentage of sulphur and phosphorus contained in the pig and scrap, but of course it is necessary to employ only the purest. Ores containing sulphate of baryta in large quantities are an exception, but it should always be looked for and such ores carefully avoided. In an experiment made with an ore of this description, 30 per cent. of the sulphur existing as sulphate of baryta was added to the metal. Several experiments were made some time ago on a series of charges at Landore from the same cargo of pig iron—No. 1 hematite—and ores from various districts, no scrap being used in any of the charges, and the following results were obtained. No. 1 being the percentage of sulphur in the pig iron, and No. 2 that in the finished steel:

Ore.	No. 1.	No. 2.
Elba	0.025	0.025
Marbella	0.025	0.025
Somoroastro	0.025	0.025
Melilla	0.025	0.025
Taouda	0.025	0.025
Soumah	0.025	0.025

To insure that the pig iron was not mixed, samples were taken in each case when the metal was melted, and it was found uniform throughout.

M. Pourcel, at the last meeting of the Institute, stated that steel made from ore charges was unsuitable for plates. I can only say that the whole of these charges were manufactured into plates which had a breaking strain of from 27 to 29 tons per square inch, and elongated from 25 to 30 per cent. in 8 inches.

The pig iron most suitable for the open-hearth process (the sulphur and phosphorus being low) is that containing the least carbon and silicon. In the first place it contains a higher percentage of iron, and in the second, it does not require to be so long in the melting furnace before the metal is completely decarburized. Moreover, pig iron containing a large percentage of silicon, although it is all oxidized, invariably yields inferior steel. Why, I cannot say. More than 0.50 per cent. of manganese is objectionable, not only on account of the delay it causes, but because of the destruction of the silica bottom by the formation of a fusible silicate of manganese. It is not only difficult that can be explained that a metallurgist, dealing with what may be called this mysterious compound steel, has to contend with, but also those which our present knowledge fails to account for. From long experience, I find that steel from different brands of hematite pig iron, chemically the same and made from the same ores, not only act differently in the furnace, taking more time, cutting the bottom, &c.,

but in their finished state show a marked difference in their tensile and other tests. At first I was inclined to impute this to some defect in the mode of analysis, which failed to detect minute traces of elements, possibly derived from the coke or limestone used in their manufacture; but, in contradiction to this, I found that two cargoes of pig iron of different brands, both of which worked in a most unsatisfactory manner by themselves, gave, when mixed in equal proportions, results which were everything that could be desired. Others invariably gave good results per se, and, by mixing as many brands as possible, uniform results may be obtained. Experiments made at Landore show that no metal added to the bath of steel has the slightest effect, as far as the elimination of sulphur is concerned, and manganese is the only metal that will counteract it. Manganese has been described as a cloak for bad material. No doubt this is so to a certain extent, but, at the same time, its presence is indispensable in steel made by an oxidizing process. An ingot from a charge composed of Swedish pig iron and puddled bar made from the best hematite pig containing no manganese, will break into pieces at the first blow of the hammer, while a similar ingot, containing 0.08 per cent. manganese, will forge.

Tungsten alloyed with steel appears to harden without detracting from its toughness, but I doubt much whether the advantage gained compensates for the cost. Tungsten is also said to add to the magnetic power of steel, but of this I have no experience. In steel supplied to a Cornish mining company from Sheffield for borers, I found as much as 10 per cent. of tungsten. As far as fracture goes, this alloy is the most beautiful of all steels.

I have no experience as to the effect of tin on steel, but a bar of iron made from tin-plate shearing, from which the tin had been to a considerable extent removed, was extremely red short and unworkable; the amount of tin contained in this sample was 0.15 per cent. Lead and zinc, when added to a bath of steel, are simply volatilized, without producing any effect except that of half choking the melters.

Chromium gives great hardness, but at the same time causes brittleness, and may be put down as useless.

The effect of copper upon steel seems to be greatly exaggerated in most metallurgical works; it is generally stated to cause more red shortness than the same amount of sulphur. In some experiments made at Landore, it was found that 0.10 per cent. of copper produced no appreciable effect on the quality of steel; and even when the amount was increased to 0.30 per cent., only a slight cracking on the side of the bloom was observable. This question is, perhaps, more important than appears at first sight. One possible difficulty that soft steel manufacturers will have to contend with will, no doubt, be the scarcity of manganese ores suitable for the manufacture of ferro-manganese, and many good ores might be rejected on account of the presence of copper, a very frequent companion of manganese. At the present time ferro-manganese containing 5 per cent. of copper would certainly be unsaleable, although, in my opinion, it could be used with impunity.

In conclusion, I may remark that any comparisons made by me of the merits of the two great processes for making steel—i. e., the Bessemer and Siemens—would doubtless be considered prejudicial; but I believe it is now generally conceded that for soft steel the latter carries off the palm, and this I attribute to the complete elimination of the silicon, to the mixture of different brands of pig, and to the absolute certainty with which the carbon in the finished steel can be controlled.

A paper which was looked forward to with more than ordinary interest, was that of Herr R. Pink, an engineer of the Hoerde Works, Westphalia.

ON THE DEPHOSPHORIZATION OF IRON IN THE BESSEMER CONVERTER.

We regret to say that to those who have followed the literature of the subject closely this paper must be a disappointment. As far as analyses, tests and working details are concerned, nothing is given which was not fully presented to the readers of *The Iron Age* as early as January 22d, when we gave a review of the facts published by Herr Massenez. Herr Pink states that the Hoerde Company do not feel justified in publishing later details, which are being prepared for publication by a number of eminent metallurgists. One subject, however, is referred to, the report of which is worthy of being quoted in full, as follows:

A point of some importance in connection with this process is the blocking up of the converter with slag, and in cases where proper provision against this has not been or cannot be made, it proves the source of much delay. To provide against such a defect, many methods of fluxing the basic additions at an early period of the process have been tried with but negative success. At Hoerde, however, a system has been used that is very promising, and, when a proper isolating medium for separating the acid from the base is used, there is no doubt blocking up will be greatly reduced, if not entirely got rid of. The system referred to is the building in of good fire-clay bricks on the points where the slag adheres, principally on the back of the throat and along the slag line of the converter when in its teeming position. At first, only 12 inches down the throat were so lined, but behind this the block-up was as great as usual. This zone was then deepened to 5 feet in a converter of 16 feet, and the nose kept perfectly clean where the fire-bricks were built in; still the slag blocked up directly below this zone. This is, however, of small importance, and, indeed, tends to keep the iron from boiling over, while its position in no way interferes with the regular working of the converter. The blocking up of the converter appears not to be thoroughly understood; for whereas the Rhenish Steel Company have no cause of complaint with their 6-ton converters, and Hoerde no difficulty with the 3-ton ones, the 8-ton vessel of the latter firm causes a good deal of trouble. No difficulty has been found in eliminating the phosphorus, even when such large patches of fire-brick have been used as are here referred to.

The small 3-ton converters at Hoerde can be much more rapidly manipulated than the larger 8-ton vessels, and the delay in taking the tests is not half so great. Delay is the cause of more blocking up than anything else. To avoid this, there appears as the very best remedy exceedingly rapid manipulation of the whole plant and the reduction of the necessity of taking many, or any, tests during the charge. When working with a perfectly known quantity of phosphorus and silicon, the former can be reduced to 0.07 or 0.08 without even once testing. Again, when the bottoms do not stand, the blocking up is very bad. This is no doubt caused by the insufficient fluxing of the dolomite loosed from the bottom. The slag, being then thicker, adheres more easily. In all cases, the heat of the charges has been greater and the blocking up less when using the highest obtainable blast pressure.

Great speed in working, together with large ladles that allow of rapid teeming, combined with a sufficiency of phosphorus and manganese, as also good bottoms, with a minimum duration of 10 charges, and the use of fire-brick zones at the points most liable to incrustation, appear to be the solution of this inconvenience. Bottoms cause trouble principally on account of their irregularity, giving at one time 16 charges, and then, again, only four or five. The undoubted cause of this is the insufficient calcination of the dolomite, which, when exposed to the influence of the atmosphere after being ground, or even when grinding, rapidly absorbs moisture. It must be admitted that, if the causes of bad bottoms are as above stated, with more experience and care in preparing them they ought all to go up to the highest figure here given.

The average life of bottoms, either rammed round pins or clay tuyeres, reaches about nine charges, and with bricked ones better results have only been obtained occasionally. Converter linings last, including the necessary patching, from 90 to 130 charges. Patching consumes about 50 per cent. of the amount of bricks required when first lining up, so that a 3-ton converter requires for, say, 120 charges, or a total production of 460 tons, as near as possible 4500 basic bricks.

The irons now used at Hoerde are their own rejected foundry No. 3, foundry scrap, a half-mine forge pig, the white forge pig of Messrs. De Wendel, Messrs. Metz, of Luxembourg, and that of the Rhenish Company, in the province of Hanover. This latter contains as much as 3 per cent. of phosphorus and about 2.5 per cent. of manganese. The 3-ton plant produces about 40 tons daily, very nearly the same as when working the same converters acid lined. The shop is so cramped for room that rapid working is an impossibility. In this department, tires, axles, plates and material for wire are solely manufactured. Upward of 4000 tires have already been turned out and many hundreds of axles. Bottom casting is exclusively used, the tire ingots being cast in groups of four, the axles in groups of three double ingots, while for wire 8-inch parallel ingots in groups of four are cast. These latter weigh about 600 pounds, and are rolled down to 1½-inch billets in one heat on a 12-inch train. The 8-ton plant has, for want of sufficient basic material, and during the alterations now making, only one of the three converters working on the system. This has to take its turn with the others, and from causes mentioned at the commencement of this communication, the production has not been so regular as that of its small neighbor. Here only rail ingots are cast, in groups of 8 or 10 inches square. These are then rolled direct in one heat, without previous forging or cogging.

Doubts have been expressed as to the capability of producing hard steel by this process. Little experience has been gained in Hoerde in this direction, as nearly all orders are for comparatively soft material. The axle orders are specified as not under 31.75 tons per square inch in tensile strength, and a contraction at the point of breakage of not less than 35 per cent. For tires the lowest tensile limit is 25.57 tons, and the least allowable contraction 35 per cent. However, the sum of the tensile strength plus the contraction must reach 60. Such conditions can be fully met, and many test pieces show up to 40 tons, with a contraction of 39 per cent. This being the general quality desired, no efforts have been made at producing harder steel.

In the softer qualities—for plates, wire, &c.—it is at times astonishing what results are obtained. With 23.40 to 25.40 tons of actual breaking weight, as much as 75 per cent. of contraction has been reached. At the same time, this ingot iron can take very high heats, forging and rolling without a flaw. The production of this especial quality is so simple, the cheapness of the raw material, the certainty in working, its softness and its ductility, all point to its driving, at no very distant date, puddled iron plates out of the market. For wire even of the smallest gauges it has been declared better than that drawn from billets puddled from charcoal pig.

An interesting and practical proof of the quality of this steel has been given during the last few days. The fire-tube of a Cornwell boiler at one of the mines in the neighborhood of Dortmund had to be removed on account of two of the plates bulging in. The water with which this boiler was fed contained such large quantities of common salt that an incrustation of several inches was formed in a very short space of time. Under these circumstances the plates got red-hot and buckled in. They show no flaw, although the indentations are, in some cases, 4 feet long, from 6 to 18 inches wide and 7 or 8 inches deep. These plates were manufactured at Hoerde, under the system of Messrs. Thomas & Gilchrist, in February of this year.

The character of plant that the Hoerde Company possess is ill suited to the requirements of this process, which accounts for its slow development, and Hoerde has had the disadvantage of being the experimental bureau for Germany. In order to get the full benefit that the process undoubtedly brings, special plant should be designed for it. Spacious shops, with good facilities

for clearing the pits of ingots and slag-boxes, are very desirable; possibly also the converters should be built up in sections, and, above all, plenty of blast and great speed in working. When a charge of 8 tons of white forge iron, containing up to 2 per cent. of phosphorus, is converted, including the afterblow, in eight or nine minutes, the metal will be at least as hot as that when gray silicious pig is used by the old method. In proof of this, a charge of white phosphoric pig was blown in the presence of Geheimrath Dr. Wedding and Prof. Finkener, and for the purpose of getting a correct diagram the charge was turned down no less than eight times to take the necessary tests. The actual time of blowing was under nine minutes, and the steel was cast from the bottom as well as could be wished for, without the least skull.

At the Rhenish Steel Works, in Ruhrort, the process is worked even more successfully than at Hoerde, and the following German firms have arranged for working or are working under this system: Messrs. De Wendel, Messrs. De Dietrich, Gienanth Brothers, Stumm Brothers, the Lothringen Iron Works at Ars, on the Moselle; the Barbach Iron Works, the Rothe Erde, near Aachen; the Bochum Company, the Königin Marien Works in Saxony, and others.

A more detailed paper on the same subject was read by Messrs. C. B. Holland and A. Cooper, of Sheffield, giving recent experience with the Thomas process in England. We shall make room for it and the interesting discussion to which it gave rise in the next issue of *The Iron Age*.

Useful Gas Blow Pipe.

Mr. F. H. Wenham, the well-known English scientist, who has made many improvements in various kinds of mechanical apparatus, has recently devised a new form of gas blow-pipe, which promises to be of very

great value. If the mouth of an ordinary blow-pipe is made use of, having an orifice in the jet large enough to act upon the entire flame of an ordinary gas burner, the resulting flame will be ragged and noisy. With such a blast and nozzle it is impossible to obtain the immovable or pointed flame, or pencil, which is absolutely required for many operations, especially those of soldering and lead burning. In addition to these objections, the large size of the nozzle of the blow-pipe causes such an expenditure of air that a continuous blast cannot be maintained from the mouth, and it is necessary to stop repeatedly in order to fill the lungs. If a bellows is used for this purpose, the motion has to be quite rapid, and there is a great waste of air.

The annexed cut represents Mr. Wenham's apparatus full sized. A is a brass tube, having a coned nozzle, B, at its free end. At the other extremity is a screwed plug, having an interior gas nipple, C, and an exterior plug for entering the end of the elastic tube D, for conveying gas from the nipple socket of an ordinary gas burner; L is a small jet pipe turning into the tube A at right angles, so that the orifice (which is very minute) shall direct a stream of air straight into the axis of the body of the instrument; F is an elastic tube about 18 inches long, provided at the other extremity with a trumpet-shaped mouthpiece of ebony or ivory, with a disk of 1½ inches in diameter, in order that it may be held securely behind the lips in maintaining the strong pressure required for the blast. The jet at E is much too small to furnish the full supply of air required by the quantity of gas to be consumed; its action is entirely mechanical and inductive, by carrying forward the air and gas mixture formed in the tube or body A. At the base of this there are four orifices or cross openings, as shown. G is a split ferrule; this, when drawn back entirely or partly, closes the orifices, in order to proportion the supply of air to the amount of gas let on.

When there is a full supply of gas, and these orifices are quite open, with a strong mouth blast, the spire of flame issuing from the end at B will be 3 or 5 inches in length, perfectly stationary and quiet, and ending in a fine point. If the heat is too great for the purpose required, and the gas supply has to be turned down, the air-regulating ferrule G must also be drawn back, else the flame will be extinguished. When properly adjusted, either for maximum or minimum heats, this instrument in either case gives the required pointed flame, and as the orifice of the jet at E is rather smaller than that generally used in an ordinary mouth blow-pipe, a continuous blast can easily be kept up without intermission, with the advantage that the flame can be traversed over the work in any direction, instead of the work being brought up, as in the case of an ordinary fixed flame.

Diameter of nozzle orifice at B, .23 inch; four openings at base, .23 inch; diameter of orifice gas at nipple at C, .07 inch; orifice of air or blow-pipe jet E, .02 inch.

This apparatus, although designed especially for the mouth blow-pipe, is equally applicable to use with the foot bellows. We understand that the heat given by this blow-pipe is sufficient for a great many kinds of work which are ordinarily done in a forge fire, or with the lead burning machine.

A very ingenious piece of machinery is a log tramway in use by a Truckee (Nev.) lumber mill. Logs 10 inches or a foot in diameter are hewn round and smooth, and their ends are coupled together by iron rods. These logs, laid side by side upon rads ground for a distance of perhaps

three miles, form the track. Of course the road looks quite like an ordinary railroad track, except that logs are used instead of rails and the ties are at much greater intervals. The wheels of the engine and cars are concave on their outer surface and fit the curve of the logs. The power is applied to a wheel in the middle of the forward axle on the engine. The most remarkable loads of logs are hauled upon the cars, and the affair is regarded as a decided success. It is very cheap, its construction is simple, and it is not easily damaged.

Towing on the Erie Canal.

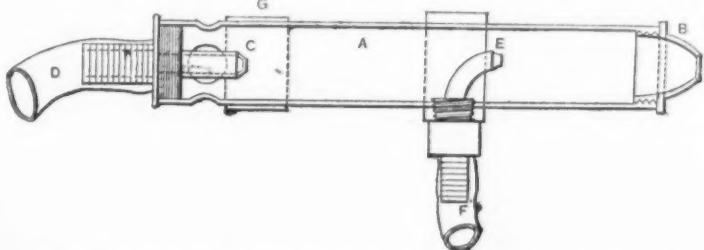
State Engineer Seymour has made a series of observations on the use of steam for the Erie Canal, which, according to the *Buffalo Commercial Advertiser*, is to be given special prominence in his forthcoming report.

Believing that a careful test of the economy of moving grain by the Illinois system would be of use in solving the problem of canal transportation, and being anxious to learn by experience just what the obstacles are in the way of all boats navigating the canals, he made arrangements with Captain Hathaway, of the steamer Emma, and her consort, to carry from Buffalo to New York the engineers in his department and himself, with the apparatus necessary to determine the power developed by the engine, the velocity of the currents and so forth. * * * The Emma and her consort, the Hathaway, were loaded with wheat at Buffalo on the morning of July 11, the former having 7300 bushels, or 217 tons, and the Hathaway 7800 bushels or 234 tons. They were examined by the official inspector at Buffalo and Black Rock, and the draft found to be exactly six feet. No special facilities were given the Emma and her consort on this trip. Mr. Seymour desired to see the results of a practical ap-

plication of steam to an Erie canal-boat, with the Illinois coupler-attachment, under ordinary circumstances, and the record of the voyage shows that it was an ordinary run and nothing more. Low water and seed-grass were encountered, and vexatious delays at locks were experienced. The detentions for lockages aggregated 26 hours and 51 minutes; for low water, 8 hours and 21 minutes; for supplies, 2 hours and 42 minutes; and on account of experiments, 2 hours and 40 minutes; and in the river for supplies, 1 hour and 3 minutes, and on account of experiments, 1 hour and 30 minutes, making the total running time 8 days and 12 hours, or, including lockages, 9 days 14½ hours. This is nearly one-third less than the average running time of horse boats. The consumption of coal on the trip aggregated 87.10 tons. In brief, Mr. Seymour estimates that two boats operated with the Illinois coupler and propelled by steam, could make nine trips a season for \$500 less expense than boats towed by horses can make seven.

If the engineer is correct in his calculations, it is clearly for the interest of every boatman to make the change from horse-power to steam-power as soon as practicable, for, with the latter, the cost of operating is reduced, while the revenues are materially increased. The great impediment in the way of this change, however, is its first cost. This is quite an item, and would probably average about \$2800; but if the cost of the mules or horses necessary to navigate two boats, with their harness and other equipments, is deducted from this bill, as it should be to make a fair exhibit, the cost of converting two first-class lakers into a steamer and consort would not exceed \$1500. The difference in the net earnings of the boats under the two systems, as matters now stand, will nearly wipe out this item in one season. But with the introduction of steam, the up movement of merchandise by canal would largely increase and the earnings of steamers would be materially augmented thereby.

But probably the most interesting part of Mr. Seymour's report is that which shows the speed of the steamer Emma, and the consumption of fuel depended on the depth of water in the channel. The canal from Buffalo to Lockport is 9 feet deep, and from Lockport to Rochester the average is nearly 8 feet. The average time of the Emma and her consort between these points, after deducting the effect of the current, was 2.2 miles an hour, with an expenditure of fuel of 25.7 pounds to the mile; while from Clark's Bridge to the Richmond Aqueduct, where the water was less than 7 feet deep, the speed was only 1.7 of a mile an hour, and the coal burned was 52.8 pounds per mile, or 30 per cent. less speed, with more than twice as much fuel. If the canal throughout its entire length was as deep as that part between this city and Rochester, the speed could be increased enough to save a full day on each trip with the same consumption of coal. By using the waste water as a power to draw boats into the locks and out again, Mr. Seymour thinks that 13 hours more could be saved on each trip. In other words, he believes that by deepening the canal a foot and introducing power at the locks, a day and a half could be saved each trip, which would enable steamers to make two more trips a season than at present and horse boats one. Now, all these improvements could be made for a comparatively small outlay of money. It is certainly to be hoped that the Superintendent of Public Works will make his improvements and repairs with the design of ultimately giving to commerce an 8-foot canal with power locks.



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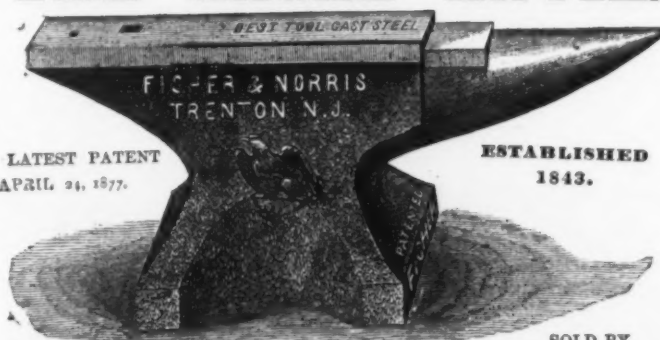
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The Iron and Coal Trades of Japan.

A number of commercial reports by Her Majesty's Consuls in Japan have been issued, and they contain incidentally some information of interest to our readers. From Hakodate we learn that the working of the coal mines at Porome, at a distance in a southeast direction of 70 miles from Sapporo, has been started. Engineers from America are laying down a tramway from there to the mouth of the Teheari River, and as the sand banks there are a great drawback, engineers have arrived from Holland in order to endeavor to overcome that obstacle. At Hakodate hydraulic works are to be commenced forthwith, to supply the town with water. Evidently they are to be on an extensive scale, for the cost is \$140,000. The water is from a spring on the hill, some four or five miles from Hakodate. There is to be a large reservoir on the brow of Hakodate Hill, and tanks all over the town, at a distance of 300 or 400 yards apart, to be used also in case of fire. With regard to the trade of Hiogo and Osaka, we note that the imports of metal show the large increase of \$168,600, the value of the imports in 1878 being \$391,800, as against \$223,200 in the previous year. Iron continues to be the most important item of metals. Deliveries for the year 1878 were 70,337 piculs, valued at \$238,000, as compared with 34,480 piculs, valued at \$175,600, in 1877. This gives an increase in quantity for the year 1878 of 24,857 piculs and in value of \$62,400. This increase is, to a certain extent, accounted for by a remarkable development of the importation of old wire rope and old iron chain, &c. Up to the end of 1877 the quantity of iron of these two classes which was imported was comparatively insignificant, but during 1878 old wire rope alone was imported to the extent of 18,000 piculs. The iron in question is principally used for nail making, the Japanese now preferring nails thus made to those manufactured from ordinary nail rods. This preference has naturally caused a decline in the value of nail rod iron, and a consequent decrease in the importation of this article. Lead also exhibits a large increase; the value of the importations in 1878 being \$99,400, and in 1877 only \$41,600, and the quantity imported in 1878 nearly three times as much as that in 1877. Prices ruled lower during the past year, a fact which explains the increase in value not being in the same proportion as the increase in quantity. It is said that in consequence of the scarcity of production and resulting high price, the only market for Japan copper (beyond a small quantity to China) exists in India, whither, as a mode of remittance, it is shipped to Hong Kong. We further learn from Hiogo that the Kobe Iron Works were first opened for business in June, 1873. These premises are situated on a plot of land about three acres in extent, on the east side of the bay, about a quarter of a mile from the Foreign Concession. Having water frontage, a wharf, and sheer legs for lifting heavy weights, vessels drawing 18 feet of water can come alongside the wharf to discharge or load heavy machinery, boilers, &c. Marine and general engineering work, ship-building and repairing, boiler making, iron and brass founding, &c., are all carried on with private capital. Repairs to a steamer's machinery not requiring the use of a dock, can be effected at these works under the superintendence of a complete staff of European foremen.

With reference to the trade of Kanagawa, we note that the imports of metals amounted to \$1,352,312 in 1878, against \$1,157,075 in 1877. The metal trade there is almost exclusively in the hands of the native merchants, who, by combining, manage to supply themselves at pretty nearly their own prices. The effect of this combination is particularly felt in the case of damaged iron sold to arrive, as the importer is compelled to submit to the rate of depreciation which these men think fit to establish. Iron is set down at \$744,719, being an increase of \$123,000 on the returns of the previous year. The returns do not give the quantity, but the Chamber of Commerce record the deliveries as follows:

Piculs.
Flat and round 34,225
Nail rods 21,257
Pig 8,040

While for sizes and qualities of bars, sheets, &c., suiting the immediate wants of the buyers, a fair price, giving a small commission on home cost, has been obtained, unsuitable sizes and qualities have almost been unsaleable at any price, and the stock of flat and round iron on hand at the end of the year was almost exclusively composed of undesirable parcels, probably shipped by manufacturers to relieve their stocks at home when the production has been carried on at a loss, as shown by the number of failures in the iron trade and by the number of workshops closed during the year. Nail rods opened with a stock of 6633 piculs. Quotations were as follows: Assorted fell from \$2.60 @ \$2.90 in January to \$2.30 @ \$2.70 in December. Small sizes likewise receded from \$3.35 to \$2.75 @ \$2.95 at the end of the year. The stock on the 31st of December was 11,530 piculs. Pig iron and pig lead are chiefly imported for the Japanese government use. The latter article has fallen off from \$202,030 in 1877 to \$148,705 in 1878. Prices opened at \$7 @ \$7.25 per picul, declining gradually until August, when they touched \$5.75, but about the end of the year recovered to \$5.90. These variations followed somewhat the course of the home market, but, taken all round, imports must have shown a loss on cost. Tin plates show an increase of \$21,067. The demand for this article would be doubtless much greater if the numerous tin shops, which are now seen all over the country, had to manufacture their tinware from tin plates, which is not the case, as an enormous quantity of old tin kerosene cases are thrown into the market and disposed of at a very cheap rate. Prices for plates opened at \$5.60 @ \$5.80 per box, and following the course of the home market, they fell to \$5.30 @ \$5.50 at the end of the year. These, as a rule, were about the equivalent in cost.

Of the mineral products of the district of Nagasaki, coal occupies by far the most important place. Of the coal mines at present worked, the chief is that of Takashima. The

net output of this mine during 1878, was 141,772 tons, of a value, in Nagasaki, at say \$4.79 per ton, of \$679,088. The whole of this coal is brought into Nagasaki harbor in junks or lighters, towed by a steam tug. The coal is shipped from here to other ports in Japan to Shanghai and other places. The following is a statement showing how the above output was disposed of within the year:

Tons.
Sales in Nagasaki and other Japanese ports 63,314
Sales in foreign ports (Shanghai, &c.) 57,401
In stock 21,057

Total 141,772

The principal other coals which find a sale on the Nagasaki market are, in the order of their value, those of Karatsu, Taku, Mike, Senabuku. We are not in a position, however, to give particular information with respect to any of the mines where these are produced, with the exception of Mike, situated at the head of the Shimabara Gulf. The total output of the Mike mine, in 1878, was 81,035 tons, of which there were transported from the mine to Nagasaki, say, 5086 tons.

Tons.
To the port of Kuchinosu (on the peninsula of Shimabara) for shipment to Shanghai, or sale at Kuchinosu 7,915
To other places in Japan 11,513
Or was sold at Mike 36,501

Total 81,035

It will be seen that of this coal only a part is sent to Nagasaki for shipment. The following statement will show how the output of this mine for the year was disposed of:

Tons.
Sales in Japan, including Nagasaki 64,761
Sales in Shanghai 8,157
In stock in several places 8,117

Total 81,035

The future of the trade of Nagasaki, to all appearance, depends much on the development of coal mining in the district. The difficulty at present in the way of a greater extension of mining operations seems to be the want of sufficient capital on the part of the mine proprietors and the want of necessary security to attract foreign capital to this enterprise. Among the other mineral products of the district, sulphur is about the only one which deserves special mention. Copper, iron, antimony and other ores occur, but are not produced in any great quantity. Lime is also found. From Niigata, we learn that the Akatani coal mine, situated about 2 1/2 miles from the Agano-kawa, is worked with indifferent success. The coal is excellent, but enterprise does not at present seem to turn that way, and the amount annually raised is small and merely to supply local demand. The coal mentioned as having been discovered in the island of Yezo, in Keishin, has been examined by an Englishman on board the "Kelho-Maru." He says it is very good, and resembles the best English coal. Japan produces little coal so good, he says. It is hoped that some mercantile firm will initiate some plan of exporting this coal, and ascertaining the amount which can be produced. Coal has been discovered on the coast of Keishin, at Chinatoo. On examination, the sample appeared to have been exposed to the weather, and was deficient in oily quality; but if care were taken in mining, it would doubtless prove of good quality. The Coreans have an objection to digging on their hills and opening up mines, no doubt because there are few hills which do not contain graves. Until this custom has changed no mining development can be expected.—Colliery Guardian.

Nickel Bronze.—A French company, La Société Française Anonyme de Nickel, is endeavoring to supersede the nickel plating of brass and copper by the use of solid nickel bronze, which is thus obtained: The ore, garnierite, extensive deposits of which exist in New Caledonia, the French penal settlement, is worked by Messrs. John Higginson & Co., of Nouméa. It is by them subjected to a roasting or preliminary fusion, which forms a regulus, containing from 60 to 70 per cent. of metallic nickel. This substance is shipped to the works of the French company, at Septèmes, near Marseilles, where it is smelted into ingots and granules containing 99 1/2 per cent. of pure nickel and 1/4 per cent. of utilizable metallic substances. The extent of the mineral deposits in New Caledonia, the reduction in the cost of freight owing to the concentration of metal through the preliminary fusion, and the economy effected by the new methods of reduction devised by M. Jules Garnier, enable the company to sell the pure metal at about one-half the price it obtained three years ago. For a long time past efforts have been made to work nickel, but without success, until about a year or so ago, because it was found too brittle; now, however, pure nickel has been rolled and forged, cups, knives and other articles having been formed of it. As a rule, the pure nickel is mixed by the founder with various proportions of copper, zinc and tin, according to circumstances, to form nickel bronze; but at least 20 per cent. of nickel is required to secure protection against the action of the atmosphere, and to give the desired tint. All articles, according to the Society of Arts Journal, that are now made of brass or copper nickelized, may be produced in solid white nickel bronze.

Submarine Experiments in the Seine.—Experiments have been made on a large scale in the Seine of Garrett's new submarine apparatus. They have been most successful. The inventor was attired in the ordinary diving costume, and remained 35 minutes under water without requiring a renewal of air from above. When he rose to the surface after his immersion he was in excellent condition, while his spirits appeared to be singularly buoyant.

The shipping of the world did not double in the whole 17th century. Since that time it has increased tenfold, and has doubled in the last 25 years. It now measures 20,000,000 tons. There has also been, besides the increase in tonnage, a great increase in speed in the last two centuries. Vessels average at least four times the speed of that period, so that, with a tenfold increase in tonnage, the total maritime commerce may be called 40 times that of 1650.

Trade Report.

Office of THE IRON AGE.
WEDNESDAY EVENING, May 19, 1880.

During the past week the financial markets have been active.

The importations of specie and bullion for the week ending May 14 amount to \$126,458, including \$4370 gold and \$121,458 silver. Since the 1st of January the importations will reach \$3,323,286, consisting of \$1,247,284 gold, \$2,074,923 silver and \$1079 brass and copper coin. From the 1st of August, 1879, to May 14, 1880, there has been a total importation of \$81,330,918, of which \$70,505,565 is gold and \$10,824,353 silver.

The ruling rate for call loans in the money market has been 4 @ 5 per cent., exceptional loans being made as low as 3 per cent. and as high as 6 per cent.

Government bonds have been strong and prices have advanced a fraction. The entire bond offerings to the Treasury to-day were \$4,273,000. The amount accepted was \$3,000,000. Railroad investments have been strong.

The stock market was weak until Friday, and prices declined $\frac{1}{2}$ @ 6 per cent. On Friday there was an advance of $\frac{1}{2}$ @ 4, but a reaction set in on Saturday afternoon and the prices of the leading stocks reached the lowest point for many months, the decline for the week being $\frac{1}{2}$ @ 16 per cent. To-day there has been a steady recovery, and at the close of business this afternoon the market was strong. The principal dealings have been in the coal shares, Erie, Kansas and Texas, Wabash and Pacific, Pacific Mail, Western Union Telegraph, Lake Shore and New York Central.

The bank return shows a gain of \$4,170,475 in surplus reserve, which now stands at \$10,238,625, against \$10,303,625 at this time last year, and \$14,128,775 at the corresponding period in 1878. The loans show a loss this week of \$2,563,500, the specie is up \$2,586,500, the legal tenders are increased \$1,072,200, the deposits other than United States are up \$2,752,900, and the circulation is decreased \$74,500.

The following is an analysis of the bank totals of this week compared with that of last week:

	May 8.	May 15.	Comparisons.
Loans	\$281,137,700	\$281,137,700	Dec. \$2,503,500
Specie	33,391,500	35,278,000	Inc. 2,886,500
Legal tenders	17,577,100	18,299,300	Inc. 722,200
Tot. reser.	78,645,500	75,579,300	Dec. 3,066,200
Deposits	258,333,000	261,075,900	Inc. 2,742,900
Reserve re-			
quired	64,580,750	65,268,975	Inc. 688,225
Surplus	6,067,850	10,238,625	Inc. 4,170,775
Circulation	20,572,000	20,498,400	Dec. 73,600

The foreign trade movements at the port of New York since our last issue are shown in the following tables:

For the week ended May 15:

	1878.	1879.	1880.
Dry goods	\$967,748	\$1,027,479	\$1,017,519
General mdae.	5,521,347	5,095,399	7,542,836

Total for week: \$6,489,095

Previously reported: \$6,155,228

Since Jan. 1: \$108,790,331

Previously reported: \$115,300,436

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Chesapeake and Ohio	153	174
" " 1st Pref.	74	75
Delaware, Lack. and Western	80	80
Delaware & Hudson Canal	73	73
Express-Adams	111	113
" American	35	35
United States	45	45
Wells, Fargo & Co.	107	108
Erie	36	36
" Pref.	59	59
Hannibal and St. Joseph	26	26
Homestead	69	69
Houston and Texas	33	33
Illinois Central	53	53
Kansas and Texas	30	30
Keokuk and Des Moines	35	35
Lake Shore	102	102
" Pref.	24	24
Little Pittsburgh	6	6
Louisville and Nashville	12	12
Marietta and Cincinnati	7	7
Metropolitan Elevated	94	94
Michigan Central	28	28
Morris and Essex	107	107
Mobile and Ohio	14	14
Manhattan Railway	26	26
Nashville and Chattanooga	68	68
New York Central	125	125
New York Elevated	113	113
New Jersey Central	67	67
New Central Coal	22	22
Norfolk	106	106
Northern Pacific	24	24
" Pref.	44	44
Ohio and Mississippi	27	27
Ohio Central	18	18
Ontario Silver	12	12
Ontario and Western	27	27
Pacific Mail	74	74
Quicksilver	9	9
Reading	54	54
Rock Island and Pacific	19	19
Silver Cliff	4	4
St. Louis and Iron Mountain	43	43
St. Louis and San Francisco	31	31
" 1st Pref.	53	53
St. Paul	71	71
" Pref.	100	100
St. Paul and Sioux City	38	38
Standard	29	29
Union Pacific	84	84
Wabash and Pacific	11	11
Western Union Telegraph	27	27

GENERAL HARDWARE.

The state of the market is much the same as last week. The retail trade are fairly employed, and jobbers report an increased demand from the same class throughout the country. The orders, however, are merely to tide over immediate requirements, as confidence in the permanence of present prices on many leading lines of goods cannot be sustained while values of iron and other metals remain in the unsettled and demoralized condition they occupy at present. Foreign Hardware is neglected, but prices remain steady.

The demand for Nails is light, and prices are very irregular. No change has been made in the card rate since our last writing, but it is expected that at the meeting of the Atlantic States Nail Association, to be held in this city to-morrow (Thursday), a lower card will be adopted, and the price conformed more nearly to the rate adopted by the Western Nail manufacturers than is the case at present. Pending this meeting Nails are freely offered on the basis of \$3.50 for rod.

The combination prices for Deep and Common Stamped Tin Ware are utterly disregarded, and we have omitted our usual quotations of these goods. Some makers quote Deep Ware discount 50 per cent., and Common discount 40 per cent., but in the unsettled condition of the trade any quotation must be considered nominal. We hear of an effort being made to place the business on a more satisfactory basis.

We print below circulars of Russell & Erwin Mfg. Co., and Mallory, Wheeler & Co., showing an important decline in price of Padlocks:

We have this day made our discount on Padlocks and Padlock Keys, on pages 387 to 413 of 1879 catalogue, 33 1/2 per cent., net, in place of 10 and 5 per cent., as heretofore, subject to change without notice. For an order of 50 dozen at one time an extra discount of 10 per cent. will be allowed, and continued through the season. All orders subject to our ruling rates at date of shipment. No prices guaranteed.

RUSSELL & ERWIN MFG. CO.,
New Britain, Conn., New York, Philadelphia, Baltimore, Md.

NEW HAVEN, CONN., May 17, 1880.

We this day reduce Padlocks and Padlock Keys to 33 1/2 per cent. discount from our January list, in place of 10 and 5 per cent., as heretofore. In addition thereto we allow a further discount of 10 per cent. on an order for 50 dozen or over, and the same 10 per cent. quantity discount for all subsequent orders for any quantity during the season ending June 30, 1880. A bonus of 2 per cent. may be deducted from all bills if paid within 30 days of their date.

MALLORY, WHEELER & CO.

The Goodell Company, Antrim, N. H., announce to the trade that, "Owing to the sharp decline in the value of Iron, the price of Family Cherry Stokers has been reduced to \$6 per dozen, the same price as ruled last year."

Coulter, Flagler & Co., Nos. 37 Chambers and 69 Beale streets, illustrate in their advertisement on another page "The Defence" Padlock, to which we invite attention. They say of it: "The Defence Padlock is a new jaw Lock, the principal point being the clamp stationary, each tumbler working in a socket, making it impossible to pick or get out of order in any way. These Locks are made of the best malleable iron. They quote them as follows: Nos. 110, \$9; 111, \$11; 112, \$13; 113, \$16 per dozen. Discount 75 and 10 per cent.

The Stanley Rule and Level Company were awarded the first premium on Spirit Levels, Rules, Planes and Squares at the Australian International Exhibition, just held in Sydney, New South Wales.

BRITISH IRON MARKET.

London, Wednesday, May 19, 1880.

[Special Report by Cable to The Iron Age.]

Scotch Pig.—There is no change to note in the condition of the market, the tendency to lower figures continuing, and prices are reported as still weak. Our quotations are reduced 2/ on Glengarnock, 1/6 on Gartsherrie and 1/ on Eglinton. The following are makers' prices:

Gartsherrie	58/
Coltness	57/
Glengarnock	55/
Eglinton	48/

Manufactured Iron.—The market remains at least weak, with little business doing. We quote: Best Staffordshire Bars, nominally, 49.

Steel Rails.—The demand is very light, and quotations, in the absence of business, are nominal. We quote, for ordinary sections, 27/ 10/ @ 48.

Iron Rails.—There is a marked improvement in the demand, though actual transactions are small. We quote Welsh, nominally, 46 @ 46. 10/.

Old Rails.—Are without change, stocks remaining light and offerings moderate. Prices are weak. We quote Old T's, 44.

Scrap.—Nothing doing.

IRON.

American Pig.—The market this week shows more signs of vitality, and a better feeling in regard to the early future prevails. We do not hear of any sales of domestic Iron worthy of mention, but the inquiry is better than it has been, and small lots move with more freedom. As far as prices are concerned there is no improvement, and we repeat the nominal quotations of last week, which, as nearly as possible, represent the views of makers: Foundry No. 1, \$26 @ \$28; Foundry No. 2, \$25 @ \$27; Gray Forge, \$25.

Scotch Pig.—Scotch Iron continues to arrive freely, and, as the market is not in a position to take the Iron, the bulk of the arrivals are being stored. Since our last writing the demand has improved, and sales during the week aggregate about 4000 tons various brands on private terms. Steam freights from Glasgow continue low, and are quoted 4/ @ 5/. We quote: Eglinton, \$21; Coltness, \$24; Glengarnock, \$22.50 @ \$23; and Gartsherrie, \$22.

Rails.—For both Steel and Iron Rails we hear of considerable inquiry, but actual sales, if negotiated, are kept very quiet. We quote, nominally, Steel \$60 @ \$65 and Iron Rails \$48 @ \$52.

Old Rails.—Sales are reported of 10,000 tons Old T's and D. H., in lots, at \$25 @ \$26. The market, however, seems to be over-loaded, and with many more sellers than buyers, and the stock here being constantly increased by fresh arrivals, the outlook at the moment is not encouraging. We quote, nominally, \$25 @ \$26 for T's and D. H., respectively.

Scrap.—The supply of Scrap Iron in store is enormous and out of all proportion to the present requirements of the trade. Business in this branch is of the quiet order, and no sales worthy of mention are reported. Reference to our list of imports of Iron for the week ending 18th inst., will show rather conclusively that it is not the intention of foreign shippers that an Iron famine shall occur in this country if they can prevent it. We quote No. 1 Wrought, nominally, \$26 @ \$27, from yard.

METALS.

Copper.—The market here has been paralyzed during the week, there being neither buyers nor sellers. The price of Lake Copper is nominally 19 1/2, which is also nominally the value of Baltimore. The only thing selling are outside lots. London cables Best Selected 264 and Chiff Bars \$56. Some six weeks ago we gave some Spanish copper export statistics which we received at the time from Spain direct. Since then we have been favored with statistics of Spanish copper production, procured by a London firm, to the following effect:

	1878.	1879.	1880.
Ore	583,550 at 3 per cent.	17,506	
Precipitate	14,890 at 60 per cent.	8,914	
Bars, &c.		135	
Total		26,575	

	1879.	1880.
Ore	550,000 at 3 per cent.	16,500
Precipitate	22,616 at 60 per cent.	13,570
Total		30,070

In the supplement to the London Mining Journal of May 1, on page 501, there will be found the report of the Chairman of the Rio Tinto Copper Mining Company, read by him at the annual general meeting of the shareholders April 23. We take therefrom the following passages: "Meanwhile, in the South Lode, where the extraction has hitherto been made, we have ample mineral for several years to come, and the quality and Copper contents improve. During 1879, 906,600 tons of ore have been extracted from this lode. Part of this quantity, say about 24,000 tons, was shipped to England and Germany, but the greater part was, as usual, subjected to treatment for the extraction of Copper on the spot." "We are now extracting, under the Deutscher patent, 15 to 20 tons of Copper per week from a heap of Smalls, and are commencing to replace the 'telers' or burning heaps by machinery for grinding the raw ore. The cost of producing Copper by this new process is conclusively proved to be less than by the old." "The precipitate maintains its high quality and reputation, and yields an average of 75 per cent. of metallic Copper. The Copper made in 1879 amounted to 7451 tons of 21 cwt., net, after allowing for draft and moisture. Our deliveries of pyrites for 1879

were 230,713 tons of 21 cwt., the Copper in which amounted to 5661 tons of 21 cwt. Our sales of pyrites for 1880 here and on the Continent amount to 270,000 tons. We have made a further sale, since the report was printed, raising the total quantity sold to over 10,000 tons. We are now employing more than 7000 men at Rio Tinto." The precipitate in the London firm's statistics is estimated at 60 per cent.; if we take the Rio Tinto figure of 75 per cent. instead, we shall have the following:

	1878.	1879.	1880.
Ore	583,550 at 3 per cent.	17,506	
Precipitate	14,890 at 75 per cent.	11,167	
Bars		135	
Total		28,808	

	1879.	1880.
Ore	550,000 at 3 per cent.	16,500
Precipitate	22,616 at 75 per cent.	16,962
Total		33,462

From all these statistics and reports it is evident that Spanish Copper production is much more important than most people have been aware of hitherto, and we have, therefore, every reason to watch it closely from now forward. Copper Ore has also been discovered, we hear, of great richness in Southern India. Manufactures of Copper remain at the following rates: Braziers, 31 1/2 @ 37 1/2; Circles, 34 1/2 @ 37 1/2; Segment Sheets, 34 1/2; Locomotive Fire-box Sheets, 31 1/2; Sheathing Copper, 29 1/2; and Bolts, 31 1/2.

Tin.—Our market has remained unchanged since our last report; there have been no transactions in tin. London cables: Straits, 27 1/2; and Singapore, \$22.50 per picul. The export from the Straits to the United States during the first half of May, the cable informs us, has been only 100 tons. For the benefit of the entire trade, it is hoped that the export this way will remain as moderate as this for some time to come. Arrivals during the week have been 3000 slabs Straits, and 2000 slabs Biliton, all of which had been sold some time since "to arrive." We receive the following from Messrs. Kreglinger & Co., Rotterdam, March 20: "Great dullness and occasional depression have been the chief characteristics of our Tin market during this month. Prices show another decline of 3 to 4 guilders, and our present quotations are consequently 12 guilders below the highest point touched during January. The sharp reaction in other metals has greatly contributed to this heavy fall, but as the statistical position of the metal is admitted to be very satisfactory, we would advise consumers to keep well in stock at present reduced rates. There is a firmer feeling at the close." According to the official tables the visible supply in England and Holland on May 1 was 13,491 tons, against 17,963 in 1879 and 16,966 in 1878, and the price £80. 5/ against £68. 10/ and £61.

EXPORT OF TIN FROM HOLLAND.

To	1880.	1879.	1878.
Germany	336	326	221
Belgium	362	10	685
France	91	26	10
Hamburg	80	31	70
The U. States	46	10	105
Other countries	59	3	9
Total	1569	644	1472

We quote at the close, large lots: Straits, 16 1/2 @ 17 1/2; English Common, 17 1/2 @ 18 1/2; Australian, 17 1/2; Biliton, 16 1/2 @ 17 1/2; and Banca, 20 1/2 @ 21 1/2, nominally. The market closes heavily. Tin Plates.—There is a little more inquiry in a jobbing way, but the market is quiet. There is nothing in the way of movement reported from England. We quote at the close, large lines, ordinary brands, per box: Charcoal Bright, \$7 @ \$7.50; ditto Turned, \$6.50 @ \$7.75; Coke Tin, \$5.50 @ \$5.62 1/2; and ditto Turned, \$5.62 1/2.

Lead.—There is nothing whatever doing. There are rumors of low prices having been taken, and it is not easy to quote the metal, which we call quiet at nominally 4 1/2. There is no market for Refined either; which may be quoted 5 1/2, nominally. Manufacturers are as follows: Sheet Lead, 8 1/2 @ 9; Lead Pipe, 8 1/2; Tin-lined Lead Pipe, 15 1/2; and Black Tin Pipe 40 1/2 @ 41 1/2, less the usual trade discount.

Spelter and Zinc.—Consumers are buying from hand to mouth, according to immediate requirements, and hardly anything transpires. At 5 1/2 per some sales of Common are reported to have been made in Boston. We quote here, Common Domestic, 5.60 @ 5.75; and Silesian, nominally 6 1/2 @ 6 1/2. Sheet Zinc is worth 7 1/2.

Nickel.—No change has occurred; the market remains steady at \$1.50 per lb. for prime American.

Antimony.—There is little stock here. Some "Cockson" sold at 21 1/2, while "Johnson" and "Hallett" are bringing 17 1/2 @ 18 1/2.

OLD METALS, PAPER STOCK, &c.

EXPORTS
Of Hardware, Iron, Machinery, Metals,
&c., from the Port of New York, for the
Week ending May 18, 1880:

	Quan.	Val.		Quan.	Val.
Danish West Indies.			Cutlery, cs.	8	\$365
Glassware, cs.	17	\$371	Wire, spools.	260	3,445
Idw., cs.	8	187	Zinc, roll.	1	35
Mf. iron, pkgs.	5	25	Nails, cs.	8	40
Nails, kegs.	25	116	R. R. cars.	38	16,350
Plum., gals.	613	695	Chains, csks.	4	218
Dutch East Indies.			Idw., pkgs.	12	363
Plum., gals.	275,000	34,375	Tinware, cs.	3	153
Cronstadt.			Yel. metal, cs.	3	190
Plum., gals.	76,300	8,430	Nails, kegs.	12	52
Dutch West Indies.			Brasil.		
Idw., cs.	41	618	Sew. ma., cs.	6	160
Plum., gals.	5,017	652	Plum., gals.	49,012	5,635
Coal, tons.	599	2,390	Mf. iron, pkgs.	21	705
Mf. copper, cs.	3	210	Glassw., cs.	58	1,454
Nails, bxs.	4	206	W. wh. pgs.	23	200
Glassw., cs.	39	377	Pumps.	1	53
Tinware, cs.	5	65	Ag. imp., pkgs.	46	582
Platware, cs.	3	177	Nails, oil, gals.	203	132
Met. goods, cs.	3	196	Idw., cs.	100	555
Hamburg.			Japan.		
Lub. oil, bbls.	2,958		R.R. cars, pgs.	105	48,562
Mach. oil, gals.	2,542		Mach., pkgs.	112	15,665
Mach., cs.	35	5,099	Scales, pkgs.	88	2,000
Nails, cs.	53	633	Locomo., pkgs.	59	17,200
Spelter, slabs.	380	4,500	Tanks, pkgs.	14	2,500
Glassw., cs.	2	142	R. R. cars.	12,693	67,250
Windmills, cs.	8	458	W. wh. pgs.	3,354	18,561
Plum., gals.	427,611	31,618	Turn table.	1	1,200
Belting, bales	6	1,106	Saws, cs.	2	375
Sew. ma., cs.	127	22,612	British Honduras.		
Idw., cs.	13	4,775	Sew. ma., cs.	6	86
Ag. imp., pkgs.	134	2,043	Pumps, pkgs.	8	320
Tel. mtl., pgs.	27	609	Plum., gals.	2,332	272
Mf. iron, pkgs.	3	260	Cutlery, cs.	2	49
Copper, bxs.	3	600	Idw., cs.	4	68
Bremen.			Glassware, cs.	13	226
Glassware, cs.	28	507	British Guiana.		
Carbon, bbls.	10	80	Plum., gals.	12,000	1,337
Ag. imp., pkgs.	276	6,680	Havre.		
Idw., cs.	1,599,558	81,000	Platware, cs.	2	130
Carbines, cs.	2	453	Mf. iron, pkgs.	3	75
Mf. iron, pkgs.	12	412	Mach., cs.	7	670
Machinery, cs.	3	250	Ag. imp., pkgs.	335	12,870
Rotterdam.			Silverware, cs.	1	3,000
Idw., cs.	23	688	Marneilles.		
Plum., gals.	78,771	6,452	Ag. imp., pkgs.	8	3,000
Ag. imp., pkgs.	18	734	Haiti.		
Lub. oil, bbls.	1,471	402	Powder, pkgs.	46	59
Lub. oil, bbls.	925	2,035	Nails, kegs.	44	192
Canada.			Hoops, bbls.	182	270
Plum., gals.	10,000	1,600	Plum., gals.	14,540	1,727
Coal, tons.	299	1,370	Glassware, cs.	22	241
British North American Colonies.			Sew. ma., cs.	14	272
Plum., gals.	2,987	240	Idw., cs.	15	258
Iron ore, tons.	260	1,050	Mf. iron, pkgs.	17	251
Idw., cs.	12	541	Iron bars.	8	66
Zinc, cs.	80	241	Tin plate, bxs.	8	61
Tel. mtl., pgs.	173	1,537	Fenouci.		
Glassw., cs.	110	461	Plum., gals.	12,000	1,354
Coal, tons.	632	2,700	Sew. ma., cs.	10	177
Mach., cs.	1	95	Mf. iron, pkgs.	67	707
Wire, pkgs.	24	200	Platware, cs.	2	173
British West Indies.			Silverware, cs.	1	750
Idw., cs.	44	592	Mach., pkgs.	10	443
Mf. iron, pkgs.	7	123	Glassware, cs.	10	973
Zinc, pkgs.	3	115	Idw., cs.	10	100
Nails, kegs.	74	289	United States of Colombia.		
Glassware, cs.	110	461	Sew. ma., cs.	90	2,763
Sew. ma., cs.	9	154	Mach., pkgs.	276	28,083
British Australia.			Lead, csks.	2	91
Mach., cs.	12	1,106	Pumps, pkgs.	11	360
Idw., cs.	2	85	Plum., gals.	2,642	456
Cuba.			Cartridges, cs.	46	1,555
Plum., gals.	40,519	4,926	Mf. iron, pkgs.	437	2,068
Hoops, bbls.	2,304	2,304	Idw., cs.	11	332
Cutlery, cs.	1	26	Steel cars.	13	321
Sterilizing, bales	4	98	Rides, cs.	15	1,887
Glassware, cs.	50	1,819	Y. metal, case	1	31
Coal, tons.	14	107	Roofing, cs.	10	119
Tel. mtl., pgs.	25	603	Sugar mills.	2	940
Mach., pkgs.	19	603	Wire reels.	18	180
Platware, cs.	4	101	Shot, bxs.	3	40
Grindstones.	144	235	Idw., cs.	3	100
Sew. ma., cs.	10	285	Glassw., cs.	90	1,200
Coke, bbls.	258	350	Cutlery, cs.	68	575
R.R. mtl., pgs.	742	6,037	Arms, cs.	8	1,659
Refrigerator, pgs.	2	51	Platware, cs.	4,312	5,312
Bycycle, cs.	1	108	Iron, pkgs.	120	274
Ag. imp., pkgs.	123	3,425	Tinware, cs.	12	227
Mf. iron, pkgs.	138	895	Nails, kegs.	17	85
Nails, kegs.	40	312	Belting, cs.	3	85
Idw., pkgs.	164	1,454	E. wheels, cs.	3	50
Lub. oil, bbls.	99	260	Crucible, bbls.	9	398
Pig iron, tons.	10	400	Powder, lbs.	625	128
Tr's h's, bbls.	6	26	Silverware, cs.	2	56
Gas flx., cs.	2	95	China.		
Tinware, case.	1	42	Plum., gals.	63,000	9,117
Oporto.			Coal, tons.	244	1,200
Mach., pkgs.	2	300	Glassware, cs.	204	9,500
Constantinople.			Nails, kegs.	290	1,402
Plum., gals.	115,510	10,733	Mf. iron, pkgs.	323	2,662
Newcastle.			Idw., cs.	49	584
Lub. oil, bbls.	15	300	Hull.		
London.			Mach., cs.	15	1,186
Ag. imp., pkgs.	4	508	Platware, cs.	2	55
R. R. cars.	2	200	Lead, bxs.	8	1,792
Idw., cs.	61	5,749	Idw., cs.	65	1,782
Tinware, cs.	10	642	Pumps, pkgs.	2	54
Glassw., cs.	24	565	Ag. imp., pkgs.	23	1,731
Tin, bxs.	37	1,278	Sew. ma., cs.	3	175
Idw., pkgs.	254	7,087	Gibraltar.		
Mf. iron, pkgs.	8	325	Sew. ma., cs.	1	11
Sew. ma., cs.	130	4,782	Platware, cs.	10	500
Pig iron, bbls.	100	2,088	Liverpool.		
Glasgow.			Roll, comp. bxs.	2	100
L. roll, cs.	1	140	S'dpaper, case	1	126
Em. wh. bxs.	4	32	Idw., cs.	29	1,251
Castings, cs.	3	59	Mach., cs.	45	3,185
Glassw., cs.	17	369	Tin plate, bxs.	37	329
Ag. imp., pkgs.	7	375	Pistols, cs.	8	4,000
Idw., pkgs.	1	18	Platware, cs.	1	90
ew. ma., cs.	1	30	Idw., cs.	23	2,000
Almeria.			Ag. imp., pkgs.	46	1,220
Derrick, cs.	1	215	Lub. oil, gals.	400	75
Central America.			Pumps.	30	2,000
Glassw., cs.	24	195	Belting, cs.	3	87
Plum., gals.	4,500	697	Sheet Iron.		
Coal, tons.	5	107			

COAL.

The trade during the past week has been exceedingly quiet. Buyers are holding off, or taking only what they cannot get along without. The companies feel that it is very important to preserve the greatest harmony of action, and so far as we can learn, they are adhering strictly to their published quotations. If customers do not choose to take Coal at these rates they can leave it. Various causes are assigned for the dullness of trade at the present moment. Some say that the warm weather of the winter has had much to do with it by decreasing the domestic consumption; others appear to think that dealers are holding off, hoping that the trade will be so dull as to demoralize the companies and thus produce a slaughter of prices.

It is generally admitted that the production of 1879 was about as large as was possible without greatly increasing facilities. The miners, in fact, worked to their utmost, with little or no pause, during the whole year. At a corresponding date last year the output was a small fraction over 7,000,000 tons. This year, while there have been considerable periods of half-time work and va-

rious other things tending to reduce the tonnage, the total output, according to Mr. Seward, is 6,800,000 tons, or only 200,000 tons less than last year, which was one of most unusual production. For the last week reported the tonnage was 380,000, while that of the corresponding week last year was 540,000. The half-time system has succeeded in reducing production less than the amount sent to tide-water in one week of half-time work. It is easy to see that the dull market results from a very large supply of Coal. At the present rate of work the production would reach 760,000 tons per week, if the miners were busy six days in the week. The companies are talking of a two weeks' stoppage next month, in order to let consumption come up with production and enable them to maintain the present high rates for Coal. Even more than this will be needed to produce any very perceptible results, because all the stoppages combined have so far only decreased the tonnage by the production of two days. Prices are unchanged, and, as we have said, the companies are holding strictly to them. Individuals are here and there disposing of Coal at from 10¢ to 15¢ below the quotations. Free-burning Stove, which is nominally \$4.25, with few buyers, has been sold at \$4, and other sizes at from \$3.75 to \$3.85, according to circumstances. Nominally, \$4 is the price for all sizes except Stove. Low Lump is \$5 to \$5.25, according to kind; Chestnut \$4, and the other sizes \$4.25.

PHILADELPHIA.

Office of The Iron Age, 220 South Fourth St., Philadelphia, May 19, 1880.

Pig Iron.—The market seems to be a trifle steadier, although prices show a further decline during the week. There is not much disposition to purchase in advance of requirements, although we hear of a few heavy transactions, but at prices much below the general market. Consumers appear to be running bare of stock, and from the number of inquiries made, are likely to be continuous buyers in proportion to the demand for their manufactures. It scarcely need be said that there is but little chance of improvement in prices until stocks are in better shape. The large quantities held by outside parties are an effective barrier to anything of that kind, although there is no reason to apprehend such protracted depression as during the past five years. The cost of production has been so much increased, however, that many furnaces will be blown out immediately, and with the heavy consumption which seems pretty well assured, it will not require many months to bring stocks under control. Until that is accomplished, the trade is likely to remain in its present unsettled and unsatisfactory condition. The present condition of the Iron trade is not the result of general business depression, but the reverse. Under the stimulus of a great revival, prices advanced at a rate almost without precedent, which brought supplies to the market equally unprecedented. The present depression is simply a blockade, which, when removed, will no doubt lead to a large, steady and healthy business. There is a general impression that prices are not far from bottom, but rumors of sales are heard from time to time at figures so far below current rates that buyers get frightened, anticipating a still further decline. These transactions, however, are quite exceptional, and are usually large lots sold for parties who desire to "get out," or compelled to realize in order to meet payments. The market, in an ordinary way, may be quoted: \$21.50 to \$23 for Gray Forge; \$22.50 to \$23.50 for No. 2 Foundry, and \$24 to \$26 for No. 1 Foundry. At these figures sales are made for such lots as consumers require, but it would be difficult to secure orders in quantity, unless at a material reduction from these rates. Scotch Iron is dull, and sold only in small lots at \$21 to \$24 for No. 1 Foundry Iron, according to brands. Bessemer is nominal at about \$25. Forced sales have been made at materially low figures. The general appearance of the market is better than a week ago; prices are lower, but there are more inquiries and prospects of an increasing demand in the near future.

Muck Bars.—There is nothing whatever doing. Sellers are plenty at \$45 to \$47, but there is no disposition to buy.

Blooms.—Are again lower, and orders would be taken at a material reduction from the asking rates of last week. The following quotations are nominal, and it is likely that a good buyer would obtain further concessions: Charcoal Blooms, \$80 per ton of 2464 lbs.; Run-out Anthracite, \$65; Sunkon Scrap Blooms, \$55 per ton of 2240 lbs., and Northern Ore Blooms, \$50.

Structural Iron.—The market is fairly active on small lots, but we have not heard of anything heavy during the past week. The decline in prices seems likely to increase consumption, and it is very probable that business during the last half of the year will be much larger than would have been the case at the high figures recently ruling. In the meantime the mills are fairly employed, and, as soon as values are definitely established, a very active demand is anticipated. Prices are easy at 3¢ for Angles, and 3.4¢ to 3.5¢ for Beams, Channels and Tees.

Plate and Tank Iron.—Prices have weakened considerably, and although a fair amount of orders have been entered, prices show a heavy shrinkage. The amount of work on hand is very light at the moment, but there has been a good deal of inquiry during the week, and it is not unlikely that business will result from some of them. Manufacturers feel somewhat discouraged, however, and in the anxiety to secure orders very low figures have been quoted. For small lots the following rates are generally asked: Tank and Common Plates, 2.9¢ to 3.1¢; C. No. 1, 3.4¢; C. H. No. 1 Shell, 3.65¢; Flange, 5.4¢; Best Flange, 5.5¢; Fire-Box, 6.4¢; Solid Bloom, 7.4¢. Sales in quantity reported at materially lower prices.

Sheet Iron.—A fair amount of business has been done during the week, but prices are easier and manufacturers would take orders on better terms than named some days ago. It is believed that the shrinkage is now pretty well out of Sheet Iron, and it is not likely that much lower prices will be

quoted than are current to-day. There is already an indication of a more active demand, and it is expected that a large volume of business will be done during the season. We continue last week's quotations, which are as nearly correct as can be given for small lots:

Common Sheet, No. 25 to 28.	3.4¢
Common Sheet, No. 22 to 25.	3.5¢
Common Sheet, No. 16 to 21.	4.5¢
Best Refined 1/4¢ @ 1/4¢ advance on the above.	
Best Bloom Sheets, No. 25 to 28.	7.4¢
Best Bloom Sheets, No. 22 to 25.	7.5¢
Best Bloom Sheets, No. 16 to 21.	7.7¢
Common Red Plates, 3-16 to 16.	3.40
Blue Annealed, 3-16 to 16.	3.5¢
Best Bloom (galvanized, discount.	25¢
Second quality, discount.	25¢

Bar Iron.—In this department there is no change to note, except that prices are lower, and little disposition shown by consumers to anticipate their wants. The present inactivity is not likely to be very protracted, however, as consumption keeps up and the demand cannot be long delayed. Sellers are very urgent, however, and if an order comes on the market, prices are cut at once so as to secure it. We understand that 2.75¢ is the nominal rate, but 2.5¢ @ 2.6¢ is nearer to the actual market, and orders of any amount cannot be had, unless at inside figures. One or two orders for Skelp Iron have been taken at 2.6¢, at which the market may be considered steady.

Steel Rails.—The market is unsettled, and, although the demand is quite active, prices show a further decline. Sales have been made to quite a large amount at about \$60 per ton for fall delivery, but, as a rule, \$65 seems to be nearer the selling price, unless under specially exceptional circumstances. The tone of the market seems to be a trifle better, but since the transaction referred to the market is unsettled and stocks less firmly held. At a time like the present it is impossible to predict what the course of the market is going to be, but if prices abroad are maintained, there is little chance of orders being taken here below the figures now current. The general quotation may be considered \$62.50 to \$65 at mill, at which a good many small lots have changed hands during the week. Foreign rails said to be offered at \$60, and in some cases on slightly better terms for favorable deliveries.

Iron Rails.—There is a good deal of looking around for Rails, but the market is so unsettled that buyers are afraid to make offers, fearing lower prices later on. The indications to-day point to greater firmness among sellers, and if maintained for a few days longer would probably have an important influence. Whatever weakness there is at present is due more to the large stocks of Pig Iron than anything else. Old Rails are firmer, and it would not require many orders to set prices on a firm basis. For that matter they seem to be firmer to-day than at any time during last week. Sales reported at \$48 to \$50 for heavy sections, at which figures the market may be considered steady.

Old Rails.—The market seems to be firmer to-day, and buyers are quite anxious to place orders at last week's prices. Sales were made at \$25 to \$26, but holders ask more money, and it is doubtful if anything could be done below \$26, and possibly not many could be had at that figure. We hear of sales at \$27 and upward for D. H., but that is somewhat excessive, and \$26 to \$27 may be regarded as a fair quotation at this date. The market is feverish and sensitive, however, and liable to sudden change. The feeling to-day is certainly stronger, and if buyers take hold with any degree of spirit, higher prices seem probable at an early date.

Scrap Iron.—The market continues in the same dull and lifeless condition as noted in our last, and prices are nominal at about \$25 for Wrought and \$20 for Cast.

Nails.—There is very little demand and prices are entirely nominal at \$3.40.

PITTSBURGH.

Office of The Iron Age, 77 Fourth Avenue, Pittsburgh, Pa., May 18, 1880.

While there has been no material change in the iron business since our last report, it is worthy of notice that a better and more cheerful feeling prevails. All that is wanted to bring about an improvement is to satisfy buyers that there will be no further shrinkage in prices. General business is slow, as is usually is at this season, when the demand for all kinds of manufactured goods commences to slacken, and the almost total suspension of river navigation is not without its effect in the same direction. The difference in the cost of transportation by river and rail is so great that in some instances orders could not be placed here if our manufacturers were entirely dependent upon the railroads. The rates by river to St. Louis this spring, a distance of 1200 miles, have been from 10 to 12 1/2¢ per 100 lbs. for heavy freight—iron, nails, &c.—whereas by rail the cost was nearly double.

Pig Iron.—There has been no important change in the situation since our last report; business continues very dull; there appears to be no demand for mill iron, and not much for foundry. However, a better and more hopeful feeling prevails, which may be attributed to the blowing out of so many furnaces, thereby largely decreasing the production, as well as the growing belief that an increased demand is near at hand. No one looks for another boom, nor is it desired, but that business will improve soon, as compared with what it has been during the past three months, there is no reason to doubt. Some operators look for business to pick up within the next few weeks, while others do not expect much, if any, improvement before July or August. There is a disposition on the part of some buyers to take the cheap lots offered, of which there are but few, realizing, as they do, that when there is a general improvement in the demand, and buyers are numerous, as is sometimes the case, the chance for getting cheap iron is not nearly so good; in other words, that a good time to buy is when there are very few buyers, as is the case now, and plenty of sellers. One of the most encouraging signs of the times is the blowing out of so many furnaces, as it evinces a determination on the part of furnace men, not to sell at or below cost, and then it will prevent an accumulation of stock, which is not desired under existing circumstances. In the

absence of sales since early in February, it is simply impossible to give reliable quotations, but the supposition is that Forge Irons are worth somewhere from \$20 to \$25, for common Cold-short to a good Neutral, and Red-short \$1 to \$2 more than Neutral.

Ores.—So far as we can learn, there has been no change in the position as between the Lake Superior Ore companies and the furnace men. Rumors still prevail that the companies contemplate making a reduction, but thus far only one company, the Cleveland Ore and Mining Co., has officially made the announcement.

Manufactured Iron.—Manufacturers make different reports in regard to the situation at present and entertain conflicting opinions in regard to the future. Some report orders as coming forward more freely and are hopeful of a marked improvement within the next 30 or 60 days, while others make a different and discouraging statement both as regards the present and future. However, we are inclined to look at the bright side, and we can see no good reason why the gloomy views entertained by some of the trade should be realized. The crops promise well in the West, throughout the country immigration is large, a large number of new railroads will be built this summer and fall, and once buyers become assured that prices are down to the lowest notch there will, without doubt, be a largely increased demand. While there is nearly always more or less "cutting," manufacturers generally appear determined to maintain the present card, and there is no doubt but a 2 1/2-cent card can be maintained as easily as a 2-cent one, and it is hard to see how the mills can make any money at anything below a 2 1/2-cent base.

Nails.—The market continues slow for the season, and there is not likely to be any very decided improvement until the fall trade opens up, which is not probable before the latter part of July. Manufacturers have had a very dull market all this year, owing to the fact that jobbers and speculators bought largely during the "boom," and have been supplying the demand ever since under the card. Speculators are now pretty well sold out; some of them will close out at a loss, and there is no particular inducement to take a "fly." The probability is that the maker will not be troubled much by these gentlemen for some time, and business will again be confined to the manufacturer and jobber, as it should be. At a regular meeting of the Western Association last Wednesday, the card was reduced to a \$3.25 base.

Railway Supplies.—There is an increasing demand for Spikes, but prices are lower. We can report a sale of 2000 kegs at 3¢—a decline of a full cent as compared with the highest. Splice Bars are quoted at 2 1/2¢. There have been no recent sales of Steel Rails reported, but an increased demand is looked for before long. The price of these has been maintained better than for almost anything else, which may be attributed to the fact that the mills were nearly all sold for several months ahead.

Old Rails.—There was a sale made here recently at \$28, which is under the market, as they cannot be laid down here under \$30 from the seaboard. But the lot in question had to be sold, and \$28 was the best price to be obtained, as they were not wanted. However, the feeling prevails that there will be an improved demand for Old Rails before long, and this belief is based on the fact that they are so much cheaper than Pig Iron, and for some purposes the former answers just as well as the latter.

Wrought Iron Pipe.—Continues dull for the season, but once prices become settled, and buyers begin to realize it, we may look for a largely increased business. We continue to quote discounts at 60¢ on Gas and Steam Pipe, and 35¢ on Boiler Tubes. Oil Well Casing, 80¢ net; do. Tubing, 28¢ @ 30¢ net.

Steel.—There is a fair business, although the demand has fallen off somewhat recently.

Scrap.—There is no movement, no demand and dealers report that it is simply out of the question to give reliable quotations

that's the standard, and they seem succeeded in obtaining the standard rates. Whether rightly or wrongly, the men believe that this was the result to them of the reduction of the make, and being so fully convinced of

this they are determined to make further reductions of make in order to enable them to maintain the rate of wages."

There are some economic fallacies in this letter, but the writer is right in the main, and it seems probable that there will be a speedy revival, despite the preparations in hand for starting several new establishments in South Wales.

FOREIGN.

FRANCE.

(Mondieur des Interests Matériels.)

PARIS, May 2, 1886.—Metals.—Some strikes have occurred in Normandy. The general aspect is less cheerful. Metals have been irregular, for the most part lower. Copper has improved in some sorts and declined in others. We quote: Chili Bars, 157.50 @ 160 francs the 100 kilos; Ingots and Slabs, 161.75; Best Selected, 170, and pure Corcor Ore, 160. Tin has been looking up. We quote: Banca, 217.50; Billiton, 216.25; Straits, 216.75; Australian, 216.75; and English, 216.25. Lead has experienced a decline to 40.50 @ 41. Spelter is also lower. We quote the same, 53. Iron.—Speculative holders have shown considerable nervousness. They have been underselling producers, and the market is now much weaker. We quote here: Merchant Iron, 24.50; Flooring ditto, 25.50; Sheet, 34, and Pig, 22.50. In the face of what is happening here, the question arises whether the owners of forces will be able to sustain their rates. They ought to be aware by this time that combinations cannot maintain present rates any longer. The market is, in fact, again the prey of speculators, not for a rise, but for a fall. The consequence is that the dealer and consumer buys cheaper at Paris to-day than he could do at the Northern and Champagne works. There are even rumors that Merchant Iron has sold here as low as 23.50, and Flooring at 24; furthermore, that Iron Rails, 30 kilos, have sold at 107 at 24 francs. The Iron and Steel tariff has come up for discussion before the Chamber of Deputies. Iron and Rail will pay 6 francs; hoops over one millimeter in diameter, the same rate; one millimeter or less, 7.50. The committee propose 7 francs for Machine Iron for wire, the others wire, 6 francs; metal-covered wire, 8 @ 10; other wire, 6; Steel in bars and Steel Rails, 6 francs. About all these articles there has been a great deal of debate. One Deputy wanted the duty on Steel Rails to be raised to 10 francs; another, to be lowered to 4.50 francs. The committee proposed 7.50, but the government has prevailed with its 6 francs. Coal.—A good demand has been noticeable for medium and best quality, but prices lack firmness.

BELGIUM.

(Revue Universelle.)

BRUSSELS, May 2, 1886.—Iron.—Quite a breakdown has occurred in our markets. Merchant Iron selling at 75 @ 76 francs, while Pig is comparatively well upheld at 8.50 @ 9 francs. This reaction has been brought about mainly by the state of affairs in England and Scotland. The market is now so very much unsettled that no business of importance comes to be transacted. But all this may undergo a favorable change from the moment the markets abroad begin to rally a little. For the time being, prices remain weak. In the Liege Basin they have receded nearly to the old figures, so far as Coal is concerned, and this has a powerful influence upon the price of iron in that region, but the present panic in iron seems to us as exaggerated as was the rapid advance of last winter and fall. Masters of forges evidently seem of opinion that Pig Iron will also soon give way to 7 @ 8 francs, and this is the reason why they do not hesitate in selling Merchant Iron at 15 @ 16 francs. Even Steel is in a drooping attitude, being several francs below the average. The Cockerill Co. has furnished the Rhymney Rail Works in Wales a great piece of machinery, similar to the one exhibited at the time at Paris. Coal.—The market has fluctuated a good deal, but the general tendency remains downward; a fresh decline of 2.50 francs seems to have been submitted to; unwashed Coke sells at 10 @ 11 francs.

SAXONY.

(Sachsenhalle.)

HAMBURG, April, 1886.—Iron.—In the Rhenish provinces and Westphalia the general aspect of affairs is becoming more and more disquieting; in Upper Silesia there is also a retrograde movement. From Dortmund we receive the following report for the week: "There has been a fresh decline, especially in Merchant Iron and Rails for mines; Pig and Sheet Iron have remained tolerably steady. Bar Iron has dropped to 50 marks. Steel Rails for mines are selling at 175 @ 180. The decline has been heaviest in the Siegerland, which region exports very little, and is, therefore, confined to supplying domestic consumption, and, as the latter has evidently sunk again to a minimum, this extraordinary weakness in the district named is easily explained. Aside from this general feeling is a depressed one. The prospect in the iron trade in this country is not at all gloomy, unless the railroads that intended to give us a fair amount of business soon come forward with their commands of which we perceive no indications yet." Metals have been inactive, with the exception of Tin, have undergone no further change. We quote: Lead, 17.50 @ 18.50 marks the 50 kilos; Copper, 69 @ 72; Tin lower, 87 @ 92; Spelter, 22; Sheet Zinc, 27 @ 27.50 marks.

AUSTRIA.

(Austrian Trade Journal.)

VIENNA, May 1, 1886.—Iron.—Confidence in the value of iron has been much shaken here during the week. The fact is that the lower price of Pig Iron in England creates a formidable competitor to our own works; it is therefore more than doubtful that the latter should be able to maintain present rates. It is now generally acknowledged that it was a big mistake at the time to push iron prices to such a pitch when it was evident that consumption was not in a position to endorse the advance. Meanwhile the dealers have frightened consumers by their continued changes in price currents; some of them changed 4 @ 5 lowered their three times in nine days. Instead of replenishing stocks, the retail trade has bought from hand-to-mouth, apprehending a further decline. In this city the larger wholesale dealers have, as a rule, maintained a firm attitude, as they have still got a great many orders on hand. Aside therefrom Austria is, in some respects, in a better position than other neighboring countries, inasmuch as various branches of iron are still being built in both halves of the monarchy, and as crop prospects are promising among us, business in general will no doubt soon revive and indemnify us for the disappointment in the spring trade; this will help hardware, also; the latter is still very quiet. Agricultural tools, however, begin to move, and so does hollow-ware, the latter even for export, especially to Russia. Architectural iron is selling slowly; in the larger cities building is this year by no means as active as it usually is in spring. If last year's crop had been better people in the agricultural districts would also have had more ready cash left; as it is, they want credit, and the iron trade is not inclined to grant such, past experience having been altogether too discouraging in the rural districts in this respect. The Southern Railroad has for sale 16,000 metric tons. Old Rails, but they have declined so much that the company cannot yet make up its mind as to what it will do with them. Metals.—With the exception of Quicksilver, all metals have been declining here. We quote: Copper rosettes, 82 @ 85 francs; old, 75 @ 80; fine quality Ingot, 95 @ 100; Tin, 110 @ 112; Antimony, 64 @ 65; Lead, 22.50 @ 23; Spelter, 24 @ 25; Best Selected, Nos. 8 to 25; Gun Metal, 68; Brass, 45 @ 64; 97 Nickel, 4 doris per kilogram; Manganese, 37 @ 38—all less 2.5.

HOLLAND.

(Koch & Vlierboom.)

ROTTERDAM, May 4, 1886.—Iron.—Early in the week the metal was dull, but soon a better feeling began to prevail; quite an extensive business was transacted, and Banca gradually advanced to 225 guilders the 50 kilos, while Billiton rose to 250. The April deliveries of Banca have been 11,666 slabs, against 9,416 in 1879, and 14,971 in 1878; during the four months, 45,236 against 30,295 and 39,994. Total visible supply, 82,227 against 113,138 and 70,681. April deliveries of Billiton, 8,309 against 6,422 in 1879, and 6,137 in 1878; during the four months, 27,365 against 21,553 and 28,444. Stock, 40,874 against 69,574 and 56,137.

CHILI.

(Weber & Co.)

VALPARAISO, March 22, 1886.—Copper.—The market opened quietly, but in spite of the anticipated further decline in the exchange market, purchasers did their best to depress the metal. After a trifling business had been done at \$8.85 on shore, and private cablegrams had reported a decline to \$7.10 in London, offers did not go beyond \$8, which holders refused, however. After the exchange has settled down to 33d, there is more anxiety shown to operate. We hear that offers as high as \$8.75, on board, have been declined. Sales 100 quintals at \$10.10, on shore here, and 600 at \$16.85. The Nitrate export thus far in 1886 has been 320,137 quintals to Europe and 129,935 to the United States, against last year during the same time of 621,830 to Europe and 29,385 to the United States. Producers at Iquique under contract with Peru still refusing to ship any Nitrate, the military governor of that place has engaged them to deliver the same to our government. The latter pays them the price stipulated in the contract, and sells the Nitrate at auction in this city. To-morrow the first 100,000 quintals will thus be offered for sale, 95 % with 10 % additional if it proves to be 96 %. There is no Antofagasta Nitrate on hand; the asking price for April delivery is \$3.75, with 5 % d. exchange. Sales 10,000 quintals 95 % at \$3.80 for the Mediterranean, and 16,500 at \$3.70 for New York. Freight—Copper to Europe, 50 % @ 52/6; Nitrate to New York, 45/4. Exchange, 90 days' sight, 33d. per dollar.

EAST INDIES.

(Schmidt, Kustermann & Co.)

PENANG, April 2, 1886.—Tin.—There has been but a moderate inquiry during the past fortnight, prices meanwhile declining from \$29.05 to \$28. Sales have been limited to 12,000 piculs for the United States, and to 750 piculs bought by Chinese for India and China. Toward the close Chinese speculators still took 100 piculs at \$28.20 @ \$28.50 per picul. The market closes duller, without any further purchasers, at \$28.30, with a stock of 100 piculs. Exchange has remained steady at 34 3/4 % @ 34 1/4 % for 4 months' sight bank bills.

Trade-Mark Decisions.

BY FRANCIS FORBES, COUNSELLOR AT LAW.

(Continued.)

§ 12. New York.—There are about as many cases reported in the New York reports as in those of all the other States combined—a fact probably due to two causes, viz., the custom in New York to publish decisions of the lower courts and of single judges, and also because the city of New York is the greatest distributing point of the United States. A digest is made of the leading cases for convenience of examination.

Who May Acquire a Trade-Mark and How.—The vendors of an article of trade or manufacture, who use a particular trade-mark to distinguish such article are entitled to protection, though they do not manufacture the goods. Taylor vs. Carpenter, 2 Sandf., ch. 603, 1846.

Aliens have the same right to relief against a piracy of their trade-marks as citizens of the United States. Coates vs. Holbrook, 2 Sandf., 586, 1845.

The sale of the good will of a business does not transfer a right to the use of the vendors sign, or trade name, e. g., "Howe's Bakery." Howe vs. Searing, 10 How. Pr., 14, 1860.

The purchasers of a spring (whose waters are designated by a trade-mark) and all the interest of the original proprietors, acquire a valid title to the trade-mark. C. & E. Spring Co. vs. H. R. C. Spring Co., 45 N. Y., 201, 1871.

It was decided that one might acquire the right to use a trade-mark, registered under the United States statute, by license, paying royalty for its use. We do not think this good law. Hilson vs. Libby, 44 N. Y. Superior Ct., R. 12, 1878.

Though one discover or invent an article and give it a peculiar and distinctive name, if he permits another, with his acquiescence, to appropriate it with that name and put it forth to the public as his own, that other will become the proprietor of the name if he meets the other conditions prescribed by the law in such cases. Caswell vs. Davis, 78 N. Y., 223, 1874.

What May Become a Trade-Mark.—"Yankee soap." Williams vs. Johnson, 2 Bow., 1, 1857; id. vs. Spence, 25 How., Pr. 366, 1863. "Cocaine," as applied to a hair wash. Burnett vs. Phalon, 3 Keys, N. Y. 594, 1867. "Bismarck," as applied to paper collars. Messerole vs. Tynberg, 4 Abb. Pr., N. C. 410, 1868.

"Bovaline" as applied to a hair pomade. Lockwood vs. Bostwick, 2 Daly, 521, 1869. "Congress Water," or "Congress Spring Water," appropriately indicates the origin and ownership of the water flowing from Congress Spring, and the word "Congress," used in connection with the bottling and sale of such water, is a proper and legitimate business trade-mark. C. & E. S. Co. vs. H. R. C. S. Co., 45 N. Y., 201, 1871.

"303," as applied to steel pens, not to express any size or quality, but the character or pattern. Gillott vs. Esterbrook, 48 N. Y., 374, 1872; id. "1/2" on cigarettes. Kinney vs. Basch, 16 Am. Law Reg., N. S. 596, 1877; id. "35" on cards for photographic mounts. Williams vs. Reynolds, 7 Abb., New Cases 17, 1879.

"Akron," the name of the place of origin of cement, is a good trade-mark as against persons not living in Akron. Newman vs. Alvord, 51 N. Y., 189, 1872. "Worcestershire" as applied to same in same manner, 15 Abb. Pr. (N. S.) 1873.

What Cannot Become a Trade-Mark.—Marks, symbols or letters which merely indicate the appropriate name, mode or process of manufacture, or the peculiar or relative quality of the fabric manufactured, as distinguished from those marks which indicate the time, origin or ownership of the fabric—e. g., the letters "A. C. A." used by a manufacturer of tickings to designate the first quality of his fabric—are not trade-marks to use which an exclusive right may be claimed. Amoskeag Mfg. Co. vs. Spear, 2 Sandf., 599, 1849.

Arbitrary names—e. g., "Galen," "Lake," "Cylinder," "Wayne" and "New York"—when applied to glass to denote quality only, are not entitled to protection as trade-marks. Stokes vs. Landgraf, 17 Barb., 608, 1853.

"Schnapps," used in Holland to mean a dram, or gin, as applied to gin. Wolfe vs. Goulard, 18 How. Pr., 64, 1859.

"Schiedam," because the name of a town. Same case.

"Club House," as applied to gin; because it had been previously used to indicate a superior quality of articles, including gin. Corwin vs. Daly, 7 Bosw., 222, 1860.

"Old London Dock Gin" is descriptive.

Binnering vs. Wattles, 28 How. Pr., 206, 1865.

"Dissicated Codfish," is descriptive. Town vs. Stetson, 5 Abb. Pr. (N. S.) 218, 1868.

A person cannot acquire a trade-mark in his own name, and thus debar others having the same name from using it in their business. Menely vs. Menely, 62 N. Y., 427, 1875. Devlin vs. Devlin, 69 N. Y., 212, 1876. Decker vs. Decker, 52 How. Pr., 218, 1876. Faber vs. Faber, 49 Barb., 357, 1867. Clark vs. Clark, 25 Barb., 76, 1857. Contra, dictum in Howe vs. Howe Machine Co., 50 Barb., 236, 1867.

Words and phrases in common use and which indicate the character, kind, quality and composition of an article of manufacture cannot become a trade-mark, even though the form of the words or phrases adopted also indicate the origin and maker of the article. The words must express only the latter to become a trade-mark—e. g., a medicine, the principal ingredients of which are iron, phosphorus and elixir of calisaya bark cannot be called (as a trade-mark) "Ferro-Phosphorated Elixir of Calisaya Bark." Caswell vs. Davis 58 N. Y., 223, 1874.

"Gold Medal," as applied to saleratus. Taylor vs. Gillies, 59 N. Y., 331, 1874.

When an Injunction will be Granted.—The name of a newspaper may be protected by injunction if the title is clear. Snowden vs. Noah Hopkins, Ch. Rep., 347. Bell vs. Locke, 8 Paige, 75, 1840. Mattell vs. Flannagan, 2 Abb. Pr., N. S., 459, 1867. Where the Court sees that the complainant's trade-marks are simulated in such a manner as probably to deceive his customers or patrons, the piracy will be checked at once by injunction. The Court proceeds upon the ground that the complainant has a valuable interest in the good will of his trade or business; and that having appropriated to himself a particular label, or sign, or trade-mark, indicating that the article is manufactured or sold by him or by his authority, or that he carries on business at a particular place, he is entitled to protection against any other person who attempts to pirate upon the good will of the complainant's friends or customers by using his trade-mark without his authority or consent. An injunction will be granted against one who affixes to his own goods a copy or imitation of the trade-mark of another, but only to the extent to which the trade-mark is imitated. Amoskeag Mfg. Co. vs. Spear, 2 Sandf., 599, 1849.

Against pirating the name of a hotel. Howard vs. Henriques, 3 Sandf., 725, 1851.

Against a colorable imitation of a trade-mark, containing such differences as the public would not be likely to observe. Clark vs. Clark, 25 Barb., 77, 1857.

The use of "Brooklyn White Lead and Zinc Company" enjoined on application of "Brooklyn White Lead Company." R. W. L. Co. vs. Masury, 25 Barb., 416, 1857.

The use of the word "Cocaine" was enjoined on complaint of the owner of trade-mark "Cocaine." Burnett vs. Phalon, 3 Keys, N. Y., 594, 1867.

Against pirating the name of a newspaper, when the name adopted by defendant is calculated to deceive. Mattell vs. Flannagan, 2 Abb. Pr., N. S. 459, 1867; Coster vs. Peters, 4 id., 53, 1868.

Against defendant's label, which closely resembled that of plaintiff, except that defendant had substituted "Bovina" in place of "Bovaline." Lockwood vs. Bostwick, 2 Daly, 521, 1869.

To protect a species of good-will analogous to a trade-mark, e. g., "Number 10," the number of a place of business which was printed on advertisements, circulars, &c., in connection with a place of business. The Glen & Hall Mfg. Co. vs. Hall, 61 N. Y., 226, 1874.

To prevent the use of the name of the defendant in such a way as to mislead or induce the public to believe that he is the plaintiff—e. g., defendant, who had no partnership, used the name of the complaining firm "Devlin & Co." Devlin vs. Devlin, 69 N. Y., 212, 1877.

Against a manufacture of labels which have such a resemblance to the genuine as to deceive purchasers of ordinary caution, or the careless and unwary. Coleman vs. Crump, 70 N. Y., 573, 1877.

To sustain such an action it is not necessary to establish a guilty knowledge or fraudulent intent on the part of the defendant. It is sufficient to show the proprietary right of the plaintiff and its actual infringement. Same case.

The Court will enjoin the use of a wrapper and label the general effect of which is to constitute a wrongful imitation of those of plaintiff, although the defendant may have replaced the trade-mark name by some others, e. g., "Sapolio" by "Saphia." The name was not enjoined. Morgan vs. Schwabacher, 5 Abb., N. C. 265, 1878.

When an Injunction will be Refused.—One Brindle, a watchmaker, stamped all watches made by him with his name. One Samuel purchased from Brindle the right to stamp Brindle's name on watches made by Samuel, and Samuel assigned his right to plaintiff. Defendants had on hand watches made by Brindle, and stamped with his name. Injunction refused. Samuel vs. Bugar, 13 How. Pr., 342, 1856.

When the name or phrase claimed as a trade-mark is calculated to deceive, i. e., "Balm of a Thousand Flowers," which is instead of being an extract of flowers was a liquid soap. Petridge vs. Wells, 4 Abb. Pr., 144, 1857.

The points of difference are so prominent and striking, as at once to produce the impression that both the plaintiffs and defendants medicines and books are different productions, and when that is the case, an action for an injunction cannot be maintained. Talcott vs. Moore, 13 Supreme Court Reports, N. Y., 106, 1875.

Plaintiff, a dealer in refined lard, stamped upon the cans in which it was put up for sale the figure of a large fat hog. The defendants stamped upon their packages of lard a globe with a small gaunt wild boar on top. Remainder of devices used with alleged trade-mark were dissimilar. Injunction refused. Popham vs. Cole, 66 N. Y., 69, 1876.

What cannot be set up as a Defense.—No defense that the simulated article is equal to

the genuine. Coats vs. Holbrook, 2 Sandf., ch. 586, 1845; Taylor vs. Carpenter, id. 603, 1846. Partridge vs. Menck, id. 622, 1847.

No defense that the maker of the spurious goods, or the jobber who sells them to the retailers, informs those who purchase that the article is spurious or an imitation. Coats vs. Holbrook, above.

The alienage of the person whose trade-marks are simulated, and his residence in a foreign country, do not affect his right to their exclusive use when he has introduced them here. Coats vs. Holbrook, 2 Sandf., ch. 586, 1845; Taylor vs. Carpenter, 2 Sandf., ch. 603, 1846.

In an action to restrain the infringement of plaintiff's trade-mark, the complaint alleged that they manufactured brandy which they put up and sold in "quart and pint bottles," on which they put the trade-mark in question. The Court found that defendant pirated plaintiff's trade-mark, but falsely and deceitfully used bottles represented to be "quart and pint" which did not hold that quantity, and that the trade-mark was designed and used to protect a fraud, and upon this ground dismissed the complaint. This ground was not set up in the answer, and does not appear to have been litigated on the trial. Nothing appeared upon the bottles to indicate the quantity contained, nor did it appear that such bottles were used in the trade, or that purchasers did not understand their capacity as a measure of quantity; or that plaintiff ever deceived any one. The findings of fact and conclusions were held, on appeal, to be erroneous. Hennessy vs. Ward Wheeler, 69 N. Y., 271, 1877.

The fact that the same device is used upon other articles of merchandise does not take from the plaintiff the exclusive right to its use upon the articles manufactured by him. Coleman vs. Crump, 70 N. Y., 573, 1877.

Statutes.—To render a person liable under the provisions of § 4, ch. 306, Laws of 1862, entitled "an act to prevent and punish the use of false stamps, labels, or trade-marks," as amended by § 2, ch. 209, Laws of 1863, the act complained of must have been done with intent to defraud some person or persons or some body corporate. Low vs. Hall, 47 N. Y., 104, 1871.

Manganese Bronze.

With this new alloy, the first attempts at manufacture of which were made a couple of years ago in Prussia, the most important results have just been obtained. The method of manufacture consists in incorporating with any of the copper alloys, whether from metal, bronze or brass, a certain proportion of ferromanganese, and it will presently be seen that the results just achieved considerably exceed those obtained a short time ago in Prussia.

Manganese bronze is at present made solely in England by one company, who have the patent. This company, in the first instance, carried out a number of experiments in order to determine the best mode of proceeding, and to insure the various qualities being the most suitable for the purposes for which they were intended to be used. This process of manufacture is now reduced to a regular system, and manganese bronze is being produced on an extensive scale. Great care is first taken in preparing the ferromanganese, which undergoes a refining process, by which the silicon it contains is estimated, and it is at the same time made into four different qualities, each having different proportions of manganese and iron, the qualities selected for use being in accordance with the nature of the bronze required. The ferromanganese is melted in a separate crucible, and is added, when melted, to the copper, which has to be brought up to a very high temperature to enable a proper combination to be effected.

Immediately after the ferromanganese is forced into the copper the free metallic manganese, having a strong affinity for oxygen, seizes upon and clears out of the copper any oxide of the metal it may contain, and renders it more close and homogeneous. A portion of the manganese is utilized in this manner, and the remainder is combined with the copper, and is said to play afterward a very important part in imparting to the bronze alloys subsequently made those qualities it is desired they should possess.

This extraction of the oxide from copper is the important point to be effected, and when this is done the character of the metal seems to be completely changed. This is, in fact, the philosophy of the great strength of the so-called phosphor-bronze.

Four different kinds of manganese bronze are now made. No. 1 has the property of forging, rolling and working at a red heat as well as cold, and for this purpose it is cast in metal molds into ingots or slabs of the requisite size and shape. From these it is rolled into rods, plates and sheets, or forged into shape for engineering purposes. In this state the metal, when annealed, has the strength and toughness of the best Bessemer or Siemens-Martin steel, having a tensile strength of 60,000 pounds per square inch. The elastic limit is said to be from 30,000 to 32,000 pounds per square inch. The stretch, when broken, is reported as very great, amounting to from 25 to 40 per cent.

Among the uses to which this metal may be put are many for which yellow metal is commonly employed, such as pump rods, bolts and screws, and for numerous purposes where great strength and toughness is required, and where steel, from its tendency to rust, is inadmissible. One very important application, and which may probably lead to others of a similar nature, has lately been carried out in the construction of a torpedo boat, which has been built entirely out of manganese bronze. The plates forming the skin of the boat were a little more than 1/4 inch in thickness. When this boat was going 16 knots per hour, no quivering or vibration whatever was felt, as was at first expected, but it set in when the speed was reduced to about 10 or 12 knots. It appears that this vibration occurs only when the engines are working at a certain number of revolutions, which are such as to make the pulsations of the propeller and the vibrations produced by the spring of the

vessel isochronous, and this is also experienced in the steel boats when the speed is such that the vibrations correspond. The plates for this torpedo boat were supplied under the condition that they should stand the admiralty test for steel plates, viz., a tensile strength of from 52,000 to 62,000 pounds per square inch, with an elongation of not less than 20 per cent. before breaking, and to bend cold to a radius twice the thickness of the plate. This test the plates stood perfectly, those taken hazardous and tested by the admiralty inspector giving between 58,000 and 60,000 pounds breaking strains, with an elongation of from 25 to 35 per cent. and bending round cold to half the radius stipulated. In consequence of these satisfactory experiments, the English government has given instructions for the construction of a number of torpedo boats of manganese bronze. The manganese bronze plates supplied for the above vessel were certainly not quite so stiff as steel plates of the same thickness; but this occurred simply because in the contract no stipulation was made as to stiffness.

Manganese bronze No. 2 is of similar quality to No. 1, but of still greater strength, and it also admits of being cast in sand under certain conditions, in which state it is fully as tough and strong as good wrought iron. A bar of this metal one inch square, cast in sand, placed on supports 12 inches apart, requires as much as 4255 pounds applied in the center to break it, and before breaking it deflects nearly 2 1/2 inches; this quality can also be rolled and worked hot into rods, plates and sheets, drawn into wire and forged into required shape.

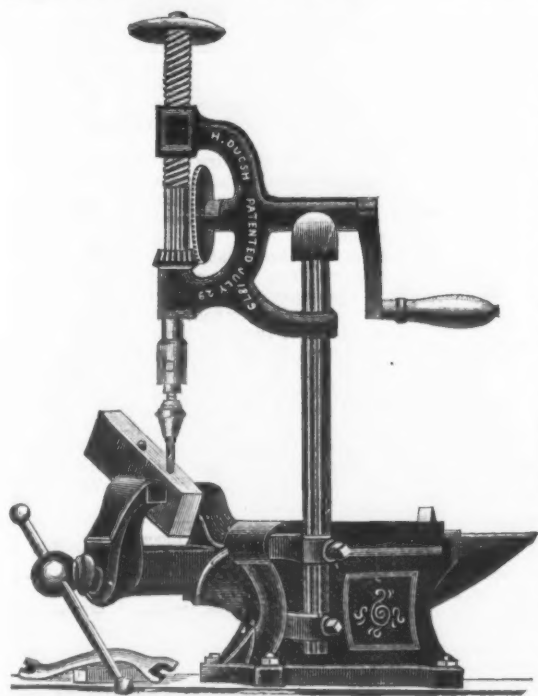
Bronze No. 3 is a very superior kind of gun metal, and is now generally superseding ordinary gun metal for most engineering purposes, particularly in connection with marine engines of the largest class. In most of the large vessels which have lately been built in England, manganese bronze has been used in place of gun metal for the main bearings, crank pins and top end brasses and other parts. Careful experiments show that the No. 3 quality has fully 60 per cent. greater strength than the best gun metal, and in the case of propellers constructed out of this kind of manganese bronze, a saving in weight of about 25 per cent. has been effected, amounting to from 2 1/2 to 3 tons on each propeller. Hence, although manganese bronze is more costly in production than gun metal, the saving in weight effected by its superior strength, brings the actual cost to even less, while there is the advantage of having less weight to carry. From the blades being thinner there is also less resistance to their passage through the water.

The fourth quality of manganese bronze is used for all purposes where friction has to be sustained, such, for instance, as in oscillating bearings, steps, slide valves, slide faces, piston rings, slide blocks, pump valves and the like. This quality has three or four times the durability of gun metal, and forms an excellent bearing surface. It has proved itself very efficient for large trunnion and other bearings and piston rings, working at a high temperature. It is undergoing trial for car bearings with satisfactory results. For the many purposes for which ordinary brass is now generally used, there would seem to be a wide field of application for this new metal, as, by the combination of the ferromanganese, brass, as well as bronze, is greatly increased in strength with but little addition to its cost—two very desirable results. On the whole, manganese bronze appears to be coming largely into use, and as its merits become known, its adoption in place of some other metals, especially gun metal, will probably become very general.

Somewhere about 3000 workmen, 600 or 700 wagons, 17 or 18 locomotive engines, 3 steam "navies" and a great quantity of minor machinery of various kinds have been engaged since 1875 at the southeast end of London, in a work compared with which the building of the pyramids—with modern appliances—would have been no very signal feat. Hitherto the one entrance to the Victoria Docks from the Thames had been at Blackwall Point, but now there is a dock capable of receiving all vessels, no matter what they may be. Three and a half miles of walls have been built, inclosing 90 acres of water. These "walls" are 40 feet high, 5 feet thick at the top and 18 to 19 feet thick at the bottom, the whole of this enormous mass being composed of solid concrete, for which 80,000 tons of Portland cement have been used. Some 4,000,000 cubic feet of earth have been dug out. It may assist the imagination somewhat to state that if it were filled into ordinary carts, the vehicles would form an unbroken line 7000 miles long. The excavations have gone through a submerged forest, and among other curiosities dug out have been a reindeer's horn, a Roman vase, and what is supposed to be an ancient British canoe carved out of solid oak. The latter is now in the British Museum. The new entrance below Woolwich will save about 3 1/2 miles of river navigation, which, in the case of vessels of great importance, the London and St. Katharine's and Victoria Docks Company are now prepared for vessels of all kinds, not excluding the largest ironclads of the British navy. The cost has been estimated roundly at £1,000,000. It is expected that all will be in readiness for the admission of the water about the second week in May. The docks will take about a fortnight to fill, and the ceremonial opening will be celebrated some time early in June.

The Engineer says that two Germans have made a new form of machine for separating the turnings and borings of brass and copper from those of iron and steel. The mixed metals fall upon a magnetized drum, to which the iron and steel adhere, leaving the copper and brass to fall into a special reservoir below. There are two cylinders rotating in the same direction, so that the iron which escapes from the first cylinder is retained by the second. The surface of the cylinder is formed by flat bands or strips of soft iron, alternating with strips of copper, and each of the iron bands is in contact with a row of horse-shoe magnets. The adherent metal is removed by revolving brushes.

ANVIL, VISE AND DRILL.



This machine was first made by a practical mechanic for his own use, and to meet a want which nothing in the market would fill. It was so highly regarded by all who saw it that he was induced to get it patented and manufactured for the market. When it was brought to our attention we saw at once its great utility, and bought the exclusive right for the whole United States. We believe it will come into general use as fast as its merits become known. The anvil face is 48 inches, and height 6 inches. Width of vise jaw, 3 1/2 inches; steel drill press, with adjustable chuck to hold 1/2-inch drills, and all smaller sizes. The article to be drilled can be held firmly in the vise, so as to be drilled at any angle, or if it is too large for the vise it can be drilled on the anvil. The drill may be removed when not in use. Price for the whole, \$15. Weight, 80 pounds. The vise and anvil are complete without the drill, and are sold for \$12. weight, 60 pounds. For all jobbing shops, it is worth much more than its cost. Farmers can do with it many jobs which otherwise would have to be sent to the shops. All Hardware dealers who do not keep them in stock will furnish them on demand, or we will send them on receipt of the price.

MILLERS FALLS CO.,
74 CHAMBERS ST., NEW YORK.

HEATON & DENCKLA,
Hardware Commission Merchants,
507 Commerce Street, Philadelphia.

E. & G. BROOKES' "Anchor Brand" Nails, Brads, Spikes, &c.
MALLORY, WHEELER & CO.'S Door and Pad Locks.
UNION MANUFACTURING CO.'S Butts.
AMERICAN SCREW CO.'S Screws.
D. R. BARTON TOOL CO.'S Edge Tools, &c.
FRANCE'S Shutter Holders.
Anti-Window Rattlers, Brass and Nickel-Plated.
WESTERN FILE CO.'S Cast-Steel Files.
AMERICAN SHEAR CO.'S Shears and Scissors.
H. M. MYERS & CO.'S Shovels, Spades and Scoops.
STEELE & SONS' Wrought Handle Sad Irons.

EXCELSIOR MILLS, Genuine Turkish Emery, BROWN & BRO.'S Brass and Copper Wire, Rivets, Spoons, &c.
GAYLORD MANUFACTURING CO.'S Tins, Chest and Cupboard Locks.

AMES' Genuine  Chester Emery.

COLWELL & COLLINS, NORWAY BOLT CO., Norway Carriage and Tire Bolts.
PLYMOUTH MILL CO.'S Black and Tinned Iron Rivets.
AMERICAN MACHINE CO.'S Fluters, &c.
STUART, PETERSON & CO.'S Tinned and Enamelled Ware, &c.
HUSSEY, HOWE & CO.'S Bar & Sheet Cast Steel.

Also a large line of Heavy and Shelf Hardware.

F. HABERMAN,

MANUFACTURER OF

Stamped, Japanned and Plain

TINWARE,

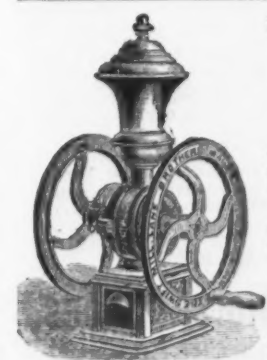
AND THE CHEAPEST AND BEST

OIL AND GAS STOVES
IN THE MARKET.

NOTE.—These Stoves are made under license from the Kerosene Lamp Heater Co., the royalties are paid by me, and the Stoves have license tags attached, so that dealers may purchase and sell them with perfect safety.

SEND FOR CIRCULARS.

294 PEARL STREET, NEW YORK.

**THE SWIFT MILL.**

ESTABLISHED 1845.

The annexed cut shows one of the many styles of Coffee Mills of our manufacture, especially adapted to Grocers' use and all retailers of coffee. They are highly ornamental, and workmanship of the very best. We make more than 30 styles.

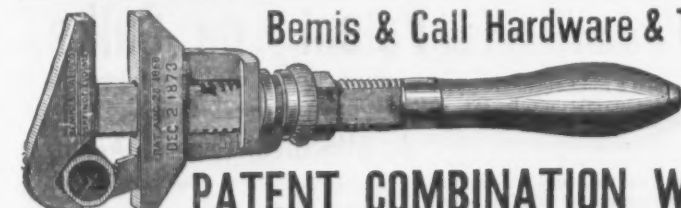
ALSO LANE'S PORTABLE COFFEE ROASTER

Will roast 30 to 40 lbs. at once, and can be used as a stove at other times. Send for descriptive list to Manufacturers.

LANE BROS., Millbrook, N. Y.

Also sold by leading wholesale houses.

Our agents, Graham & Haines, 113 Chambers St., New York, carry a full line of our goods, and will be pleased to serve you at factory prices.



Bemis & Call Hardware & Tool Co.

PATENT COMBINATION WRENCH.

These Wrenches are made from the best of Wrought Iron, with Steel Head and Jaw, case-hardened throughout, and not only combine all of the superior qualities of our Cylinder or Gas Pipe Wrenches, but also all requisite combinations of a regular Nut Wrench, thus making a combination which has no equal.

For Circulars and Price List, address

BEMIS & CALL HARDWARE & TOOL CO., Springfield, Mass.

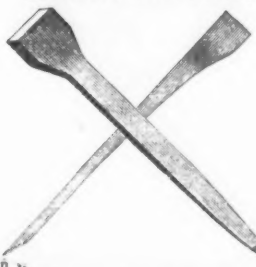
Philadelphia "STAR" Bolt Works.
NORWAY IRON  FANCY HEAD BOLTS,
Carriage & Tire Bolts. **Star Axle Clips, &c.**
TOWNSEND, WILSON & HUBBARD, 2301 Cherry St. Philadelphia, Pa.

NATIONAL Horse Nail Co.

MANUFACTURERS OF

FINISHED

(BRIGHT OR BLUED)



Iron and Tin made of the best brands of **NOR-**
Williams, Long
Wood Allen & CO., and are guaranteed to be equal to
more than its cost. Farmers can do with it many jobs which otherwise would have to be sent to the shops. All Hardware dealers who do not keep them in stock will furnish them on demand, or we will send them on receipt of the price.

NATIONAL HORSE NAIL CO.,
VERGENNES, VT.
DURRIE & McCARTY, Agents,
No. 97 Chambers St., New York

The Oldest Shot Tower in America.
FOUNDED JULY 4, 1808.

**THOMAS W. SPARKS,**

Manufacturer of

SPARKS'

American Chilled Shot,
Rivalling the English and all Others.

STANDARD DROP & BUCK SHOT
AND BAR LEAD.

121 Walnut Street, Philadelphia.

St. Louis Malleable Iron Company,
2116 MARKET STREET,
ST. LOUIS, MO.

HENRY M. FILLEY, JOHN D. FILLEY,
President, Secretary.

MANUFACTURERS OF
Malleable and Gray
Iron Castings,
GENERAL HARDWARE, &c.

W. G. FOSSICK,
Engineer and Iron Agent,
86 Cannon St., London, England.

Iron and Steel Rails,
Bars, Angles, Plates,
Pig Iron & Puddled Bars.

Old Rails, Scrap Iron, Steel Rail Ends
c. f. i. American, or f. o. b. European ports.
Contracts negotiated on the most favorable terms.
Bankers: Barnetts, Hoares & Co., London.

RIEHLÉ BROS.

STANDARD

SCALES

AND TESTING
MACHINES
Patent "Self-Adjusting" Railroad Track Scales, pronounced "the most accurate and durable" over all competitors at World's Fair, 1876. In use by Pennsylvania, Lehigh Valley, Baltimore and Ohio, and other Railroads. Patent Coal and Hay Scales. Warehouse and Platform Scales and Scales for all purposes. Machines for testing materials, all sizes.
Works, 9th St., at Master's Store, 52 S. 4th St., Philadelphia. New York Office 91 Liberty Street.

"DRAW CUT"
BUTCHERS' MACHINES.
Choppers, Hand and Power
Stuffers,
Lard Presses.
Warranted thoroughly made
and the BEST in Use.
MURRAY IRON WORKS,
Burlington, Iowa.

R. C. PURVIS,
Manufacturer of
Octagon
Tea Pots.
Near of 407 Cherry St., Philadelphia, Pa.
Send for Price List.

Established in 1839.

Formerly L. & A. G. COOK.

L. COES & CO.

Manufacturers of L. Coes'

GENUINE IMPROVED AND MECHANICS

**Patent Screw Wrenches**

UNDER PATENTS DATED

JUNE 26, 1866,
MARCH 23, 1869,
REISSUED 1870.

NOVEMBER 10, 1863,
FEBRUARY 23, 1864,
REISSUED JUNE 1, 1869,
IMPROVED AUG. 1, 1877.

The back thrust when in use borne by the SHANK instead of the Handle
None genuine unless stamped "L. COES & CO."

WORCESTER, MASS.

Warehouse, 97 Chambers St. & 81 Reade St., N. Y.
DURRIE & McCARTY, Sole Agents.

The 1880 Pennsylvania Lawn Mower.

OUTSTRIPS ALL COMPETITORS. PREMIUMS TAKEN OVER ALL OTHER MOWERS.

EVERY MACHINE WARRANTED TO WORK AS REPRESENTED.



Points Claimed as being Meritorious:

The lightest; runs more easily; cuts longer grass; requires less repairs; is more durable; cuts more smoothly; don't require sharpening once where others do half a dozen times.

PRICE LIST.

Width of Cutter.	Style of Driving Wheels.	Power Required.	Weight.	Price.
10 inch.	8 inch.	A Child.	30 1/2 lbs.	\$14.00
12 "	8 "	A Lad.	33 1/2 "	18.00
14 "	8 "	A Lady.	36 "	20.00
16 "	8 "	One Man Size.	38 "	22.00
18 "	8 "		41 "	24.00

NEW MACHINES

For Cutting Long Grass

15 inch, 10 1/2 inch Driving Wheels, 6 1/2 inch Cylinder, Man Size, 48 lbs. \$23.00
17 inch, 10 1/2 inch Driving Wheels, 6 1/2 inch Cylinder, Man Size, 51 lbs. 25.00

QUAKER CITY 10-INCH LAWN MOWER, - - List \$12.00

The QUAKER CITY guaranteed the best Mower for price manufactured.

Discount to the trade.

For Sale By

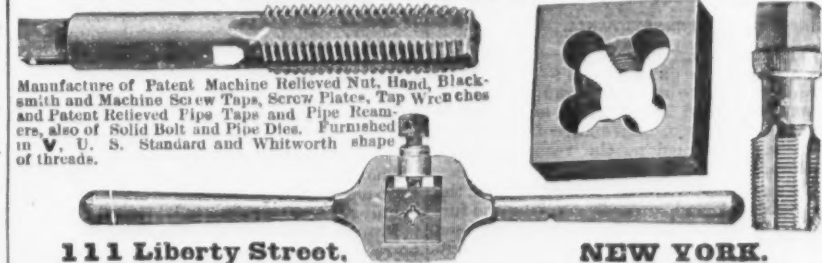
DUCHARME, FLETCHER & CO., Detroit, Mich.
LOCKWOOD, VANDORN & TAYLOR, Cleveland.
KRUSE & BAHLMAN, Cincinnati, O.
PRATT & CO., Elmira, N. Y.
LLOYD & CLARKE, Le Crosse, Wis.
SMITH & SCRIBNER, Minneapolis, Minn.
HART & CO., Louisville, Ky.

THE NEW "CHARTER OAK" LAWN MOWER.

The most beautiful and perfect Lawn Mower in the world. It stands to-day at the head of the list of Lawn Mowers in the United States and Europe. It is mounted on two large driving wheels or pulleys, and instead of being on the outside of the frames, to run in the uncut grass, they are placed inside the frames, back of the cutting blades, running on a shaft, each independent of the other, allowing the machine to be turned either to the right or the left without injury to the sod, and to be turned around in a circle no greater than its own length, and cutting at the same time. Those desiring a perfect Lawn Mower will find the "CHARTER OAK" far superior to any other. It is more durable, easier to adjust, operate and keep in order, and the driving wheels being inside the frames, enables the operator to cut the grass clean around walks, drives flower-beds, trees and shrubbery.

Manufactured in Five Sizes.
8-inch, 10-inch, 13-inch, 15-inch (standard)
18-inch.

H. S. MANNING & CO.,
Sole Sales Agents for THE MORSE TWIST DRILL AND MACHINE CO.'S



111 Liberty Street, NEW YORK.

DAVID HYMES & Co.,
92 Church St., New York.
HEDGES HARDWARE CO.
HART & CO.
CLEMON & CO.
KING & BLEIER.

PADLOCKS,

MONOGRAM, TERROR, ARGUS AND PINAFORE.

The Cheapest line of goods in the market.

Sample orders solicited.



No. 1.

No. 2.

NEW sizes Patent Malleable Iron Oilers,
Nos. 2 and 3.
pattern Heavy Screw Clamps;
strongest in the market.
Send for Price List.

Malleable Iron Castings

Of superior quality, and Hardware Specialties in
Malleable Iron made to order.

HAMMER & CO., Branford, Conn.

INDUSTRIAL ITEMS.

MAINE.

There is talk of establishing sampling and smelting works at Portland. The idea is to form a company with a capital of \$200,000, all of which will be put in the treasury for working capital. This will be divided into 2500 shares of a par value of \$100. Subscriptions will be received in due time for 1000 shares at \$25 per share. The remaining 1500 shares will remain in the treasury until such time as the company may require them for enlarging the works. The business of the company will be buying, sorting, sampling and shipping ores. They propose at first to erect only a small smelting furnace for the purpose of working up small lots of ore. Several parties, it is said, have already offered to take from \$500 to \$2000 in stock apiece.

MASSACHUSETTS.

A charter was granted a few days since for the incorporation of the Whitehead & Atherton Machine Company of Lowell, with a capital of \$50,000. There are but four incorporators, and the officers are William E. Whitehead, president; Abel T. Atherton, treasurer, and William Robinson, clerk. The foundry of the company has been for some time in operation at Tewksbury, and their proposed machine shops they hope will be ready for occupancy by August next. The main building will be of brick, 200 by 50 feet and three stories in height, and in addition there will be a blacksmith shop and engine house.

The Plymouth Mills Company, of Plymouth, have just completed a widening of their wire platform, which doubles its storage capacity. They have also put in a Fairbanks' platform scale, and are building an addition to their annealing house.

The Pacific Mills, of Lawrence, have had an engine made for them by the Buckeye Engine Company, of Salem, Ohio.

The Johnson Manufacturing Company, of North Adams, have begun a 100-foot brick addition to their mill.

The nail factory at East Bridgewater has started up.

CONNECTICUT.

Messrs. P. Jewell's Sons have just finished a main belt for Wallace & Sons, of Ansonia, which is 70 feet long, 30 inches wide, and over three-quarters of an inch in thickness, there being three thicknesses of the best leather used in its manufacture.

H. B. Brown & Co., machinists, East Hampton, are doing a good business. They recently shipped to Japan a large nut and bolt cutting machine which is capable of cutting the thread to a 3-inch nut or bolt; and they have a large one now in process of construction for the Pennsylvania Railroad Company's shops.

The new, large additions to the wire mill of E. S. Wheeler & Co., at East Haven, will be completed in a short time. They are respectively 160 feet long by 80 feet wide, and 121 feet long by 50 feet wide.

NEW YORK.

Last Thursday afternoon an accident, which might have had fatal results, occurred at the building occupied by Messrs. Abel Brothers, 190 South street. The second floor of the building was used for storing iron, and at the time of the accident contained about 300 tons of bar iron. At about 5 o'clock in the afternoon the men at work in the building heard an ominous cracking, and had barely time to rush into the street when a considerable portion of the floor gave way, carrying with it most of the wall facing on Water street. Fortunately no one was injured. The precise cause of the accident is not yet known, as the work of removing the wreck has not proceeded sufficiently to enable an investigation to be made. Messrs. Abel Brothers have been obliged to rent an adjoining building in which to store their iron while the repairs are being made. The whole wall on the Water street side will have to be rebuilt.

One of the boilers in the Rome Merchant Iron Mill burst on the morning of the 10th, killing four men and injuring a large number of others. The mill was badly wrecked. The accident will throw about 250 men out of employment.

NEW JERSEY.

Advices from Phillipsburg say: The only furnace out in this section is Durham. The Delaware Rolling Mill, at Phillipsburg, had a very brief run, and is now closed.

PENNSYLVANIA.

The following appears among the dispatches in the daily papers: George D. Roseberry, spike and nail manufacturer, of Pottsville, failed May 17, with liabilities not exceeding \$50,000. Shrinkage in the price of iron is assigned as the reason for the failure.

After a brief suspension of operations the work of tearing down and rebuilding the furnace at St. Clair, Schuylkill County, has been resumed, and now the Philadelphia and Reading Coal and Iron Company have a double force of men working there. The improvements will, it is expected, be completed some time in June.

It is reported that one of C. M. Atkins & Bro.'s furnaces, Pottsville, has chilled, and will have to be dug out. This work will be very expensive, and will cause considerable loss of time. The managers can assign no reason for the chilling.

At Newcastle, on the 13th, the only works in operation were the mill of Bradley, Reis & Co., the sheet mill of the Lawrence Iron Works and the Clara Furnace of Raney & Berger.

At Erie the erection of a large malleable iron manufactory has been commenced, which when completed will cover an acre of ground.

The Martha Bennett Furnace, at Fort Carbon, which was unsuccessfully blown in twice during the past two months, has been blown out, relined and repaired, and will be blown in some time about the 1st of June, under the management of George W. Cole.

The Philadelphia North American says that A. Weed & Co., manufacturers of improved file machinery, are working night and day, with two sets of hands; that C. W. Ervin & Co. are building an 80-horse-

power engine for a Cuban firm, and have orders on hand for five more, and that Henry Disston & Sons are erecting a large rolling mill at Tacony, where they will in future manufacture all their own steel.

John Roach, the Philadelphia ship-builder, is reported as being about to add to his establishment a large rolling mill by removing the rail mill now owned by him from Danville to a lot adjoining the ship yard.

A new machine shop and engine works have been opened at the corner of Beach and Marlborough streets, Philadelphia, by A. L. Archambault, formerly of the Kensington Iron Works.

A new branch is now being attached to the mill at Middlesex. This is a chain factory, which will be completed in a few days.

The mills at Middlesex are still lying idle, and as yet no hopes of their starting are given by the proprietors, but we hear daily from outside parties that they will be running in a short time. The furnaces are running under the new company.

It is stated that Ario Pardee has given \$15,000, and the borough of Watsontown, Northumberland County, as much more toward starting car works at that place.

On the afternoon of the 8th inst. the hoist of Leibbrandt & McDowell's Moselem Furnace, in Berks County, was entirely destroyed by fire. The furnace has not gone out of blast, as the stock is being hoisted by rope and tackle, and it is hoped it can be kept going until a new hoist can be built.

The number of tons of pig iron made at the Warwick Furnace, for the week ending Saturday, the 8th inst., was 470 tons, while at the furnace of the Pottstown Iron Company 323 tons were made in the same time.

The new furnace at Dunbar was blown in on the 12th inst., but will blow out shortly, the owners wishing only to try her and not to run her at present.

The Palo Alto Rolling Mill will probably be shut down at the end of this month. The small furnace at Rodman was to have blown out last week.

PITTSBURGH AND VICINITY.

The National Association of Window Glass Manufacturers held a special meeting in Pittsburgh last week and decided to order a stoppage of the window glass houses for three months, beginning June 1, 1880. Two or three factories that have been in operation but a few months will be allowed to run during this time if they wish. Nearly all the old window glass factories have a good stock of glass on hand sufficient to run them through the summer months. The regular meeting of this association will be held at Cape May, July 14.

There is no truth in the report that Moorhead & Co.'s Soho mill is about to shut down. A. Bradley & Co.'s stove foundry shut down on Monday, the 10th inst., for an indefinite time.

Messrs. Emerson, Smith & Co.'s saw works at Beaver Falls are running full force, with all the orders they can fill.

The oil refining business in the Pittsburgh district, which includes ten refineries under the control of the Standard Company, has been in a very depressed condition for some time. The indications are, however, that operations will be resumed early in June. The crude oil tanks are nearly all full, and it is estimated that about 385,000 barrels are stored. At No. 1 Standard refinery extensive repairs have been made, and the works can be started on short notice.

H. K. Porter & Co. shipped another locomotive to Japan last week. The engine had to be taken apart and securely packed in boxes, each distinct package bearing the address "Poronai Railway, Obora, Hokkaido, Japan."

The Pittsburgh Chain Works, at New Brighton, under present management and control, commenced operations in August, 1879, since which time it has run without interruption. The company has iron bought right, and is making several specialties. C. Waldis, formerly of Philadelphia, is the new manager.

Stack No. 1 of the Lucy Furnace Company has gone out of blast.

WEST VIRGINIA.

The roof of the hot-blast furnaces at the Belmont Mill fell in on the 14th inst. The accident was caused, it is supposed, by contraction. The loss is about \$200, and the repairs will be made while the furnace is banked up.

OHIO.

A new hot blast is being erected at the Benwood blast furnace.

The Hartford coal mines, near Salineville, will be started soon. They have been idle nearly two years.

The Portsmouth Foundry and Machine Works have six boilers ready for shipment to New Orleans. They are intended for use on sugar plantations in that region.

The Siemens-Martin department of the Portsmouth Burgess Steel Works is again running.

Brown, Bonnell & Co. thus far have had no reason to place any of their mills on single turn by reason of a scarcity of orders, and every department is running to its fullest capacity. They have a large trade in splices for railroads, and are now filling a heavy order for the St. Paul and Minneapolis Railroad Company. The boilers for the new puddling furnaces have all been placed in position, and the furnaces will be ready for lighting within two weeks.

The boiler works of W. B. Pollock & Co., Youngstown, are crowded with orders sufficient to keep a large force of men employed. At present they are finishing an iron bridge for the Brier Hill Iron Company, to be used between the hoisting house and top of the furnace which has been undergoing repairs for some time. The firm also have the contract for building three large flue boilers for the same company, to replace those injured and destroyed by the late explosion at Grace Furnace.

The Jefferson Iron Works, of Steubenville, have resumed operations after a suspension of about one month. The works comprise two large furnaces, 22 boiling furnaces and 85 nail machines. The furnaces have a capacity of 30,000 tons of pig iron per year.

At the Ironton Rolling Mill of the New York and Ohio Iron and Steel Company, the

boilers are in place and the sheet iron stacks are in readiness. The furnace is ready for operation. A kiln of ore will be fired this week.

Mr. Brownstead, of the Grant Furnace, thinks the furnace never had a better start off than the indications this season show. He argues that the third tuyere added this season is a great benefit to the manufacture of metal, which continues to be a good quality. The furnace is running about the same as last year, making about 13 tons. Sixty tons of No. 3 car-wheel were shipped to Cincinnati on Monday.

The Powell Tool Company, Cleveland, are so pressed with business as to compel an increase of their works, and they are, therefore, building an addition of 50 feet, with more forges, which will be in operation in about 30 days.

GEORGIA.

We learn from an exchange that preliminary operations have been begun for the erection of the largest iron foundry in the South. It is to be erected on the Etowah, near Rome, by J. J. Seay. The building will require 280,000 bricks, cover two acres of ground, employ 80 men and be completed by July 1.

Seventy-five State convicts are to be employed in running the Rogers Furnace, located near Cartersville, on the State road. C. B. Howard is to be of bottles of charcoal iron, used for making car wheels. As soon as he gets a sufficiency of charcoal the furnace, which has a capacity of about 8 tons per day, will be put in blast.

KENTUCKY.

Bellefonte Furnace was to have commenced her year's blast on Monday, the 17th. Pennsylvania Furnace is doing well. Iron Hills Furnace is expected to start up on the 24th inst.

Mount Savage commenced her blast on the 10th inst.

MICHIGAN.

It is reported that Charlevoix is to have a blast furnace.

The following from the *Marquette Mining Journal* is a statement of shipments of iron ore from the upper peninsula, up to and including Wednesday, May 5:

MARQUETTE.

Cleveland	2,637
Lake Superior	2,981
Champion	1,920
Ore to local points	9,643
Total	17,180

Angeline	878
Barnum	3,772
Cleveland	4,037
Goodrich	1,429
Jackson	3,542
Jackson, South	760
McComber	804
Michigan	920
National	3,210
New York	3,010
Palmer	4,080
Rolling Mill	1,420
Saginaw	2,871
Salisbury	363
Superior	6,000
Superior, Hematite	1,714
Winthrop	1,974
Total	39,837

Curry	2,175
Cyclops	2,513
Emmett	2,545
Norway	9,730
Perkins	2,920
Quinnesec	4,345
Stephenson	1,240
Vulcan	4,730
Total	39,837

Making a grand total of 68,735 tons.

MISSOURI.

The Missouri Car and Foundry Company are turning out 200 car wheels per day, and 25 tons of other castings for car-building purposes.

H. S. Hopkins & Co., of St. Louis, bridge builders, are about to erect extensive buildings near the Laclede Rolling Mills. They will give employment to from 175 to 200 workmen.

The Wangler Boiler Works, St. Louis, are full of orders.

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elaborate and expensive, the varying intensity of the light of any image being made to create currents of varying intensity, in a series of selenium plates or a number of thermopile elements. The arrangement of the receiving apparatus varies more widely. No details whatever are given as to the methods proposed by Prof. Bell.

A principle differing from that ordinarily employed has been adopted in

THE DEPREEZ INDICATOR.

which is said to be particularly suitable for high-speed engines. Generally the pencil of the indicator receives a motion from the spring parallel to the axis of the cylinder having the paper, while this cylinder has a motion proportional to that of the engine piston. M. Deprez has lately contrived an indicator in which only the pencil moves, the paper being fitted on a plane surface at rest.

The problem was to give a point, C, a motion which should be each instant proportional and parallel to the resultant of the motion of two other points, A and B. He finds a solution in the pantograph, if the three points A B C are those which, in this instrument, are always in a straight line. In adapting to the indicator, the point A is attached to the piston of the instrument, the point B (which should be guided in a straight line) to the cord commanded by the piston of the engine, and the pencil is placed at C.

The two movements of the two pistons, each multiplied by a coefficient which one is free to choose arbitrarily, are compounded in the pencil, which traces on the paper at rest the diagram representative of the work of the steam in the cylinder of the engine. This apparatus lends itself very well to making an indefinite succession of tracings on a long sheet of paper, to be advanced by a small amount each stroke of the piston.

Mr. William Renschel, of the Cleveland Bridge and Car Works, read before the Engineers' Club of Cleveland the following paper on

THE TACHYMETER PROCESS OF DUPLICATING DRAWINGS,

which may prove valuable under certain circumstances to constructors and engineers. He gives the following recipes for the preparation of the composition: No. 1.—10 ozs. by weight, pure glycerine; 1 oz. by weight, white dextrine; ½ oz., by weight, yellow dextrine, dissolved in ½ oz., acetic acid; which amount is sufficient to fill a pan 9 by 12 inches, and should not cost more than 50 cents.

To prepare this, cover the gelatine with water for half an hour; pour the water off and let the gelatine stand 12 hours covered; then boil it for half an hour by immersing the vessel in boiling water; mix the other ingredients while the gelatine is hot, and mold it in the pan. No. 2.—Used for copying handwriting: 10 ozs. pure gelatine; 3 ozs. white glue; 10 drops carbolic acid. To prepare this, soften the glue in water for half an hour; then turn off the water and boil the glue half an hour, placing the vessel in boiling water; mix ingredients well and mold in pan, which can be made out of tin or wood, and should, of course, stand level when the pouring is done; for getting a nice, clean and smooth surface, the air bubbles and foam, with other impurities which will be on top of the hot mixture, should be removed with a paper. The mixture should be about ¼ of an inch thick in a pan about 1½ inches deep. Whenever a new surface is required, the solution is easily taken out of the pan and molded over.

A little more glycerine tends to soften the mixture. For drawing with the tachygraphic ink (which can be had in red and violet), care should be taken to make the lines and figures distinct, thereby avoiding all danger of blots. Much care should be taken in making the imprint on the solution, or else crooked lines will result. The best way is to place the drawing on one end and roll it down carefully, and rub gently with a smooth, flat, thin block, with under edges rounded, or with thick paper. In removing the sheets, take care not to start too much on one corner of the paper. The imprint can be removed with a fine sponge and either warm or cold water—warm water aiding in the dissolution of the ink. Care should be taken to print as quickly as convenient after the imprint is made, and wash the same when done, as the aniline ink tends to impregnate the copying mixture, and trouble will be found in washing it out.

A very handsome price has been paid for A SPECIMEN OF THE ARCHAEOPTERYX,

a very rare and curious fossil bird, found in the lithographic stone quarries of Solingen, Germany. Herr Haberlein, owner of the best of the three specimens, has sold it to the Berlin University for \$25,000, probably the highest price ever paid for a fossil.

The Missouri Car and Foundry Company are turning out 200 car wheels per day, and 25 tons of other castings for car-building purposes.

H. S. Hopkins & Co., of St. Louis, bridge builders, are about to erect extensive buildings near the Laclede Rolling Mills. They will give employment to from 175 to 200 workmen.

The Wangler Boiler Works, St. Louis, are full of orders.

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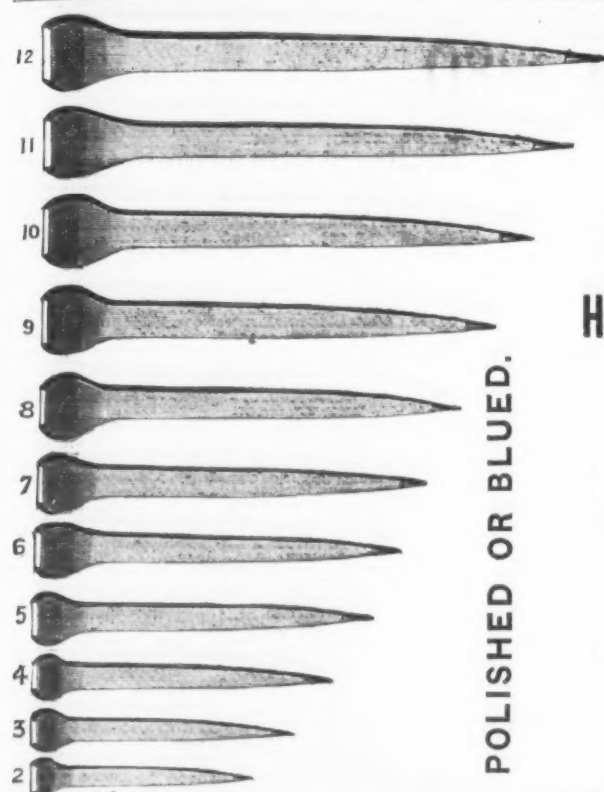
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Are the only Nails in market that are made in imitation of the Hand Process. They have the uniformity of Machine Nails and the toughness of those hammered by hand. Our

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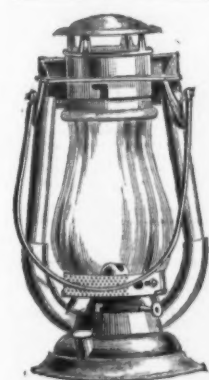
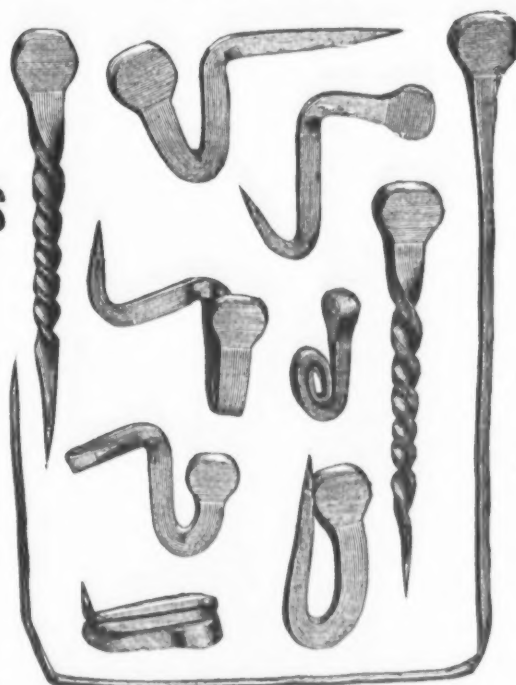
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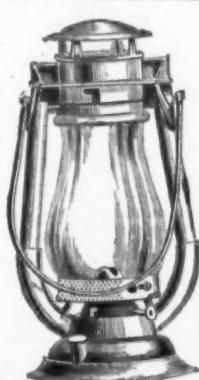
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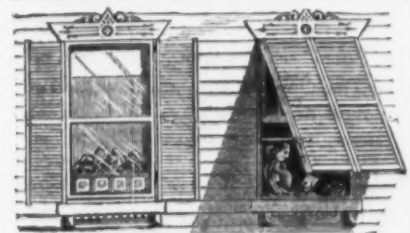
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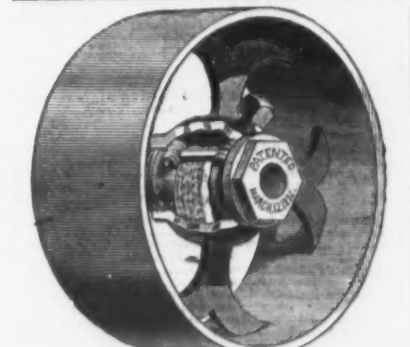
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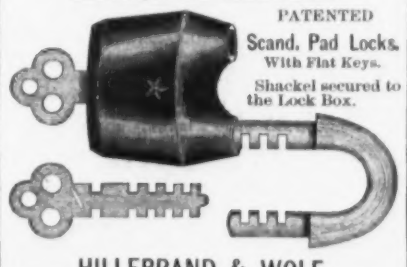


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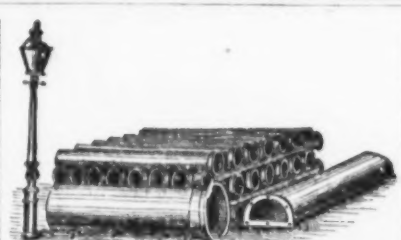
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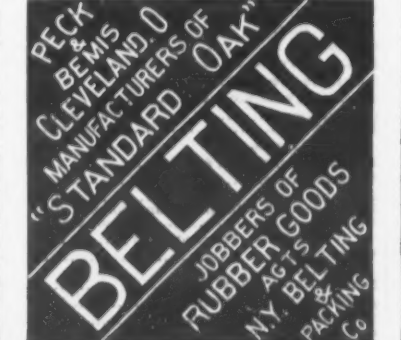
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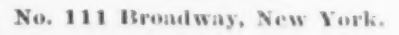
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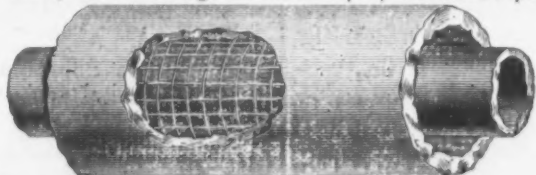
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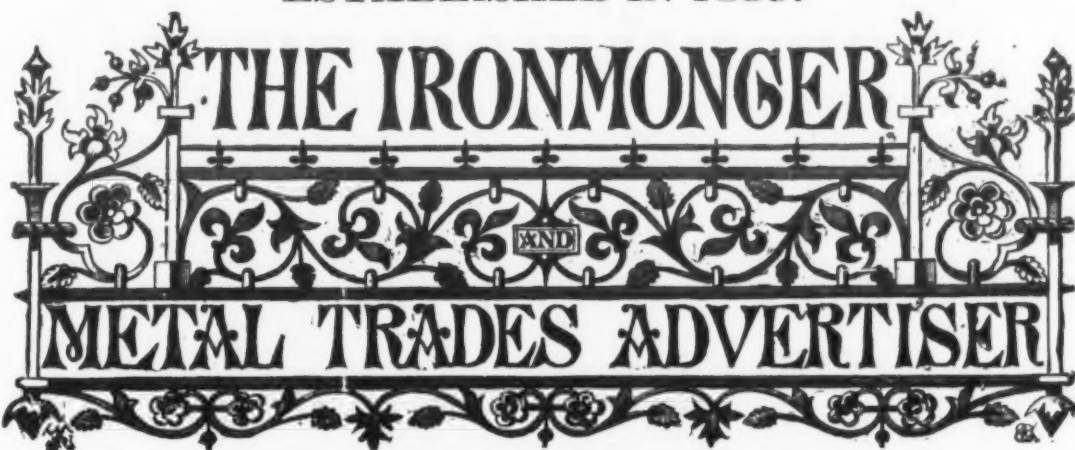
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SOUTHERN OFFICE: Cor. Eighth and Market Streets, Chattanooga, Tenn.—S. B. LOWE, Manager.

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Notes of Novelties.—This is a department of the journal always watched with interest by the trade, as it contains an account, from week to week, of the novelties which manufacturers and inventors are introducing to the notice of the trade. These articles are freely illustrated. Special Correspondents.—The Ironmonger has a deserved reputation for its special correspondence from all the principal Continental, British and manufacturing centers. The writers are gentlemen holding important positions in the districts with which they are connected, and possess facilities for acquiring information specially suited for the columns of the Ironmonger. The Week, Legal News, Trade Notes, Bankruptcies, Foreign Notes, Colonial Settings, Merchants' Circulars, &c., are each departments of the journal, containing a digest of all matters of direct interest to the Iron, Hardware and Metal Trades. In addition to the above, there is a carefully classified list of Patents, together with Editorial Notes, French, Belgian and other Special Correspondence.

SUBSCRIPTIONS

to the Ironmonger and Metal Trades Advertiser, with which is sent every fourth week the Foreign Supplement (see below), may commence from any date, but are not received for less than a year complete. The rate is \$5 per annum, inclusive of postage to any part of the world outside Great Britain. Every subscriber is presented, free, in the course of his year, a handsome and useful Ironmongers' Diary and Text Book, a work sold to non-subscribers at 75 cents.

ADVERTISEMENTS

are inserted in the Ironmonger and Metal Trades Advertiser at the subjoined rates, from which no variation can be made on any ground whatever

Size of Page—Nine Inches Deep by Six Inches Wide.

One Advertisement of every Series of 13 Monthly, 27 Fortnightly, or 53 Weekly, will be inserted in the Ironmongers' Diary and Text Book, published toward the end of each year, and presented to every Subscriber.

	53 INSERTIONS, each net.	27 INSERTIONS, each net.	13 INSERTIONS, each net.	7 INSERTIONS, each net.	3 INSERTIONS, each net.	2 INSERTIONS, each net.	1 INSERTION, net.
One page.....	Gold. \$17.50	Gold. \$18.75	Gold. \$20.00	Gold. \$22.50	Gold. \$25.00	Gold. \$30.00	Gold. \$35.00
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Quarter page.....	5.60	6.00	6.40	7.25	8.00	9.60	11.20
One-sixth page.....	3.95	4.25	4.50	5.10	5.65	6.75	7.75
One-eighth page.....	3.15	3.40	3.60	4.10	4.50	5.40	6.25
One-sixteenth page.....	1.75	1.90	2.00	2.25	2.50	3.00	3.50

SPECIAL ISSUES.

In the spring and autumn of each year there is published a Special Issue, the circulation of which is not less than Twelve Thousand (12,000) copies

THE IRONMONGERS' DIARY AND TEXT BOOK.

This is an annual presented free to every Subscriber to the IRONMONGER AND METAL TRADES ADVERTISER. It contains a large number of ruled skeleton pages for diary and other entries, and in addition much useful reference information, varied from year to year. It is handsomely bound in cloth, gilt, and as copies are used in thousands of establishments for a whole year, it is obviously a medium of exceptional value for advertisements. Sold to non-subscribers at 75 cents.

THE FOREIGN SUPPLEMENT

Is published every fourth week in connection with the extensive and world-wide circulation of the Ironmonger itself. The dates of its publication for the next twelve months will be as follows:

MAY 20, JUNE 24, JULY 24, AUGUST 21, SEPTEMBER 18, OCTOBER 16, NOVEMBER 12, DECEMBER 11, JANUARY 8, 1881, FEBRUARY 5, MARCH 5, APRIL 2 and 30.
This Supplement is published in

FIVE LEADING COMMERCIAL LANGUAGES

of the world, including English, and is sent to all the countries where they are spoken, thus placing the contents of the Ironmonger not only within reach of the native language of eighty millions of German, forty-two millions of French, twenty-eight millions of Italian, and fifty-one millions of Spanish speaking people; or, in all, over two hundred millions of inhabitants in the principal nations where the best purchasers of manufactured goods are to be found.

Advertisements are inserted in any language at the following

MODERATE TARIFF.

Size of Page—13½ Inches Deep by 9½ Inches Wide.

	13 INSERTIONS, each net.	7 INSERTIONS, each net.	3 INSERTIONS, each net.	13 INSERTIONS, each net.	7 INSERTIONS, each net.	3 INSERTIONS, each net.
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Two-thirds page.....	22.00	24.75	27.50	7.50	8.45	9.40
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One-third page.....	12.50	14.10	15.65	3.20	3.40	3.65
Quarter page.....						
One-sixth page.....						
One-eighth page.....						
One-sixteenth page.....						

Advertisers will do well to use illustrations freely. Where economy of space is an object, a left page illustrated and described in one language can be suitably described in four or more languages on the opposite or right page without illustrating.

THE WHOLE FOREIGN HARDWARE TRADE,

so far as it is experience of twenty years is concerned, will be covered by THE FOREIGN SUPPLEMENT at least twice a year. This Price List or Advertisement inserted in the Ironmonger and Foreign Supplement is a strikingly powerful and most efficient way of publicity not to be compared with any of the other ordinary channels of communication.

B. KREISCHER & SONS, FIRE BRICK.

BEST AND CHEAPEST.
Established 1845.
Office, foot of Houston Street, East River,
NEW YORK.

NEWTON & CO.,

ALBANY, N. Y., Manufacturers of

FIRE BRICK Stove Linings,

Range and Heater Linings

Cylinder Brick, &c., &c.

M. D. Valentine & Bro

Manufacturers of

FIRE BRICK And Furnace Blocks DRAIN PIPE & LAND TILE.

Woodbridge, - - - N. J.

BORGNER & O'BRIEN,

Manufacturers

FIRE BRICK

Edge Pressed Furnace Blocks,
CLAY RETORTS, TILES, &c.,
Twenty-third Street,
ABOVE RACE, PHILADELPHIA.
Twenty years' practical Experience.

PERTH AMBOY TERRA COTTA CO.,

Successors to

A. HALL & SONS, Perth Amboy, N. J., ARCHITECTURAL TERRA COTTA

FIRE BRICK.

170 Broadway, NEW YORK.

Brooklyn Clay Retort

FIRE BRICK WORKS.

Manufacturers of Clay Retorts, Fire Brick, Gas
House and other Tile, Cupola Brick, &c. Dealers in
and Miners of Fire Clay and Fire Sand. Clay bank at
Burt's Creek, New Jersey. Manufacture: Van Dyke,
Elizabeth, Richards and Tarrinton Sts., Brooklyn, N. Y.
Office: No. 88 Van Dyke St.

Watson Fire Brick Manufactory,

ESTABLISHED 1865.

JOHN E. WATSON, Perth Amboy, New Jersey.
Manufacturer of

FIRE BRICK,

For Rolling Mills, Blast Furnaces, Foundries,
Gas Works, Lime Kilns, Tanneries, Boiler
and Grate Setting, Glass Works, &c.

Fire Clays, Fire Sand, and Kaolin for Sale.

HENRY MAURER,

Proprietor of the

Excelsior Fire Brick & Clay

Retort Works,
Manufacturer of FIRE BRICK, HOLLOW
BRICK AND CLAY RETORTS.

WORKS: PERTH AMBOY, NEW JERSEY.
Office & Depot, 418 to 422 East 23d St., N. Y.

TROY FIRE BRICK WORKS,

Troy, N. Y.

JAMES OSTRANDER & SON,

ESTABLISHED 1848,
Manufacturers of

FIRE BRICK,

Tuyeres, Tiles, Blast Furnace Blocks, &c. Miners and
Dealers in Woodbridge Fire Clay and Sand, and Staten
Island Kaolin.

Established 1864.

GARDNER BROTHERS,

Manufacturers of

STANDARD SAVAGE FIRE BRICK,

TILE & FURNACE BLOCKS,
OF ALL SHAPES AND SIZES.

Clay Gas Retorts and Retort Settings, and
Miners and Shippers of Fire Clay.

Office: 116 Smithfield St., Pittsburgh, Pa.
Works: Mt. Savage Junction, Md., and Lockport, Pa.

HALL & SONS,

FIRE BRICK,

Buffalo, N. Y.

MILLER'S BRICK PRESSES

(Established 1844),
FIRE AND RED BRICK,

And Brickmakers' Tools in General.
SAML. P. MILLER & SON,
309 South 5th St., Philadelphia.

RUDOLPH FRANK,

Office, 229 FULTON STREET,
NEW YORK.

ALUMINA and SILICA

FIRE BRICKS

Works, BROOKLYN, on
the East River.
Through Cars, Canal Boats
and Vessels loaded direct from the
works to all points.

PURE SILICA FIRE BRICK,

MADE BY THE

Landore Siemens Company,

Specially for OPEN-HEARTH FURNACES.

More "heats" obtained from them than from any other Bricks known.

Imported, to order only, by

PHILIP S. JUSTICE, Sole Agent in United States,
14 NORTH FIFTH STREET, PHILADELPHIA.

GROOM SHOVEL CO.,

MANUFACTURERS OF SUPERIOR

SHOVELS, SPADES AND SCOOPS.

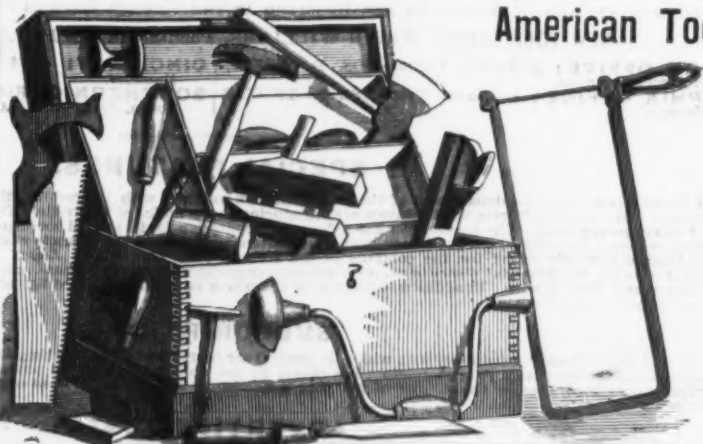
SPECIALTIES:

Mining Shovels, Hammered Solid Steel
Railroad Shovels and Spades,
Locomotive, Grain and
Sand Scoops.

OFFICE, 912 Washington Ave.,
SAINT LOUIS, MO. FACTORY,
1031 North Main St.,

American Tool Co.,

116 CHAMBERS ST., N. Y.



TOOL CHESTS OF EVERY DESCRIPTION.

Fitted up with a superior quality of Tools, and adapted for the home and export trade. Illustrated
descriptive catalogue furnished on application. Mechanics' Tools and Hardware specialties.

COVERT'S

Patent Improvement in

ROPE GOODS.

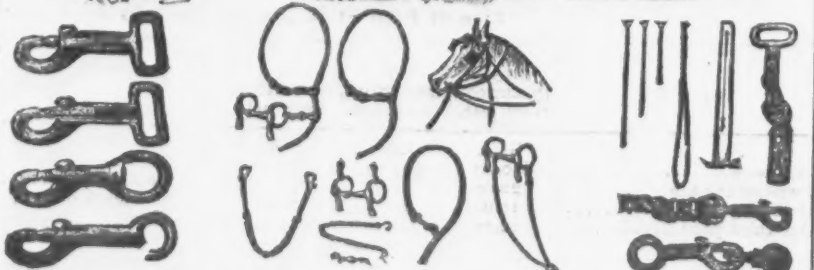
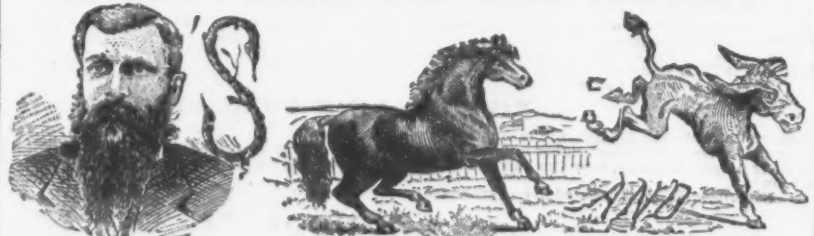
No more Splicing or Winding
Ends with Cord.

No. 1.

Rope Halters, Horse Ties, Cattle Ties, Halter Leads, &c., made by clamping the lap with steel
rings, as shown in cut. Also, clamping the end with a ring to prevent unbraiding.
This is all accomplished by machinery, and a superior article can be made at so much less cost, it
will not pay any one to make up goods the old way. We are now prepared to furnish the trade the
cheapest and best Rope Halters ever made. No. 1 illustrates the twisted and irregular form of the
spliced Halter; also the insecure method of whipping the end with cord, which invariably comes off,
and allows the rope to untwist. No. 2 illustrates the New Halter. It is made by clamping the lap
with steel rings. The end is also secured with a steel ring, which will remain as long as the rope lasts.
We have also a full line of

No. 2.

COVERT'S HORSE AND MULE JEWELRY.



Consisting of Covert's Celebrated Harness Snaps, Open Eye Bit and Chain Snaps, Snap
and Thimble for Horse and Cattle Ties, Horse Leads, Collars, Horse Chains, Rein Chains, Post Chains,
Leads, Leather Horse Ties, Breast Chains, &c. Also, Martingale Chains, Rein Chains, Post Chains,
Post Rods, &c. These goods are far superior to anything of the kind on the market. They have from
real merit become standard, and never fail to give entire satisfaction. They are sold by all leading job
bers in general and saddlery hardware at manufacturers' prices. Send for illustrated catalogue and
price list. Address COVERT MFG. CO. Sole Manufacturers, West Troy, N. Y.

The Leading Wringer of
America.

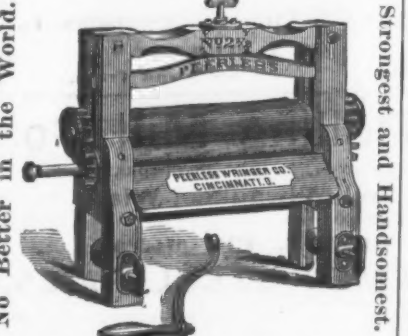
SIMPSON & GAULT, (Peerless Wringer Co.)

New York Office, 79 Chambers St. European Offices,
Place Vendome, Paris. 7 Poultry, London.

Office and Factory,
CINCINNATI, OHIO.

PEERLESS Clothes Wringers,

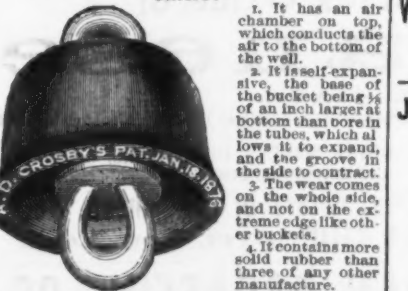
Sold by the Jobbing Trade everywhere.



Most Saleable Wringer in the Market.
TRY A SAMPLE ORDER.

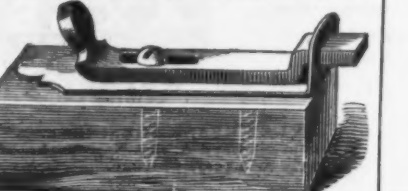
The Most Durable and Best Selling Bucket for Chain Pumps.

It has no valves to become obstructed and no
screw joints to become immovable by rust.
Advantages of the Crosby Bucket over all
others:



No charge for territorial rights. Send for Price
List. Agents wanted in every county. Address
A. D. CROSBY, Patentee and General Agent,
Cuba, Allegany Co., New York.

HYATT'S PATENT SPRING BOLT.



Patented Jan. 29th, 1878.
For Fastening Cabinet Ware, Closet and House Doors, &c.

We call the attention of the trade to these Wrought
Brass and Iron Bolts, as being the best and cheapest
in the market. Sizes, two inches and upward, both
plain and neck bolts. Two screws fasten the bolt
and bed-plate to the wood; no others are required;
the bed-plates are made of brass, from which the
spring is cut and raised, upon which the bolt slides
with an easy, elastic movement, saving expense of
screws and producing a strong, handsome and
cheap Bolt. Price list furnished on application.

BRASS GOODS MFG. CO.,
43 Chambers St., New York.

We also manufacture all kinds of Brass and Tin
Goods, Drop Basins, Thimbles and Bases for Door
Knobs, Plate Escutcheons, Brass Labels, Patent Mirror
Business Cards, &c.

Southwark Hardware Co.

PHILADELPHIA, PA.,
Manufacturers of

FOUR GRADES OF COUNTER

AND
400 and 600 lb.

PLATFORM SCALES.



EQUAL TO THE BEST AND LOWER
IN PRICE.

Send for Illustrated Catalogue.

Established 1838

Bevin Bros. Mfg.
Co.,

Easthampton, Ct.

Manufacturers of

SLEIGH BELLS,
House, Tea, Hand,
Gong Bells, &c.

Bell Metal Kettles.

No. 35

BROWNING, SISUM & CO., 85 Chambers St.,
Manufacture

Belt Hooks, Cutters, Spring Keys, D. Rings,
Staples, and everything pertaining to wire bending.
Factory, BROOKLYN.

John T. Lewis & Bros. No. 231 South Front St., PHILADELPHIA.



Pure White Lead, Red Lead, Litharge,
Orange Mineral, Linseed Oil,
AND PAINTERS' COLORS

Brooklyn White Lead Co.



White Lead, Red Lead & Litharge.
No. 182 Front Street,
NEW YORK.

JOHN JEWETT & SONS

Manufacturers of the well-known brand of

WHITE LEAD.



ALSO MANUFACTURERS OF
LINSEED OIL.
152 Front Street, NEW YORK.



The Atlantic White Lead and Linseed Oil Co.,

MANUFACTURERS OF

White Lead (Atlantic), Red Lead,
Litharge & Linseed Oil.

ROBERT COLGATE & CO.,
287 Pearl Street, New York



DUNBAR BROS.,

Manufacturers of

Clock Springs and Small Springs
of every description, from best Cast Steel.

BRISTOL, CONN.

W. & J. TIEBOUT,

Manufacturers of

Brass, Galvanized & Ship Chandlery Hardware.

No. 33 Chambers St., New York.

PIANOS

Stool, Cover and Book only \$45.75.
Organ, 13 Stops, 1 set Reeds, Stool,
Book, only \$68. Paper free.
DAN'L F. BEATTY, Washington, N. J.

PHILADELPHIA.

(Corrected Weekly by Lloyd, Supple & Walton.)
 Terms, 30 days. For 60 or 90 days, interest added at 10 per cent. per annum.

Apples.
 Peter Wright's, 100 net 110 net
 Over 250 lbs. 110 net
 Eagle (American) 100 net
Apple Papers.
 Reading No. 72 per doz \$5.00 net
 No. 73 5.00 net
 No. 74 5.00 net
 Peach Paper 5.00 net
 Little Favorites, core and silver 5.00 net
 Lots of 10 to 25 dozen special price.

Ases.
 Hunt's Kentucky and Yankee per doz \$11.00
 Man's Red Warrior 11.00
 Richmond Chief 10.00
 Beveled Axes 10.00
 Double Bit Axes 10.00
Augers and Auger Bits.—New List January 1.
 Bates' Nut Augers 10.00
 Cook's Augers 10.00
 Watson's Ship Augers 10.00
 Benjamin Pierce Auger Bits 10.00
 Grindwell Auger Bits 10.00
 Cook's 10.00
 Jennings' 10.00
 Bonney's Pat. Hol. Augers, list \$48 per doz. 10.00
 Stearns' Pat. Hol. Augers, list \$48 per doz. 10.00
Ballances.
 Light and Common 10.00

Bells.
 Bevin Bros. Mfg. Co. Light Hand Bells 10.00
 Swiss Pattern Hand Bells 10.00
 Connell's Door Bells 10.00
 Gt. Western & Kentucky Cow, new list 10.00
Bolt and Rivet Clippers.
 Chambers No. 2 each \$7.50
 No. 3 7.50
 No. 4 7.50

Boring Machines.
 Upright, without Augers 10.00
 Angular, without Augers 10.00
Boles.—Eastern Carriage Boles 10.00
 Stanley, Wrought Shutter 10.00
Braces.—Barber's 10.00
 Backus 10.00
 Spofford 10.00
Butts.—Cast Fast Joint, Narrow 10.00
 Broad 10.00
 Cast Loose Joint, Narrow 10.00
 Broad 10.00
 Acorn, Loose Pin 10.00
 Mayer's Loose Joint 10.00
 Wrought Pin 10.00
 Table Hinges and Rock Flaps 10.00
 Marrow, Fast 10.00
 Loose Joint 10.00

Butts.
 Parker 10.00
 Clark 10.00
 Shepard 10.00
 Lull & Porter 10.00
 Huffer 10.00
Chains.—German Hatter and Coil 10.00
 Galvanized Chain 10.00
 Best Proof Chain—English 10.00
Chisels.—Socket Framing 10.00
 Socket Firmer 10.00
 Butcher's 10.00
 Casters 10.00
 Plate 10.00

Coffee Mills.—Box and Side, new list Jan. 1. 10.00
 Enterprise 10.00
Cutlery.—Walden Pocket, new list net 10.00
 Landers, Frary & Clark, J. Russell & Co., Lamson & Goodwin Mfg. Co. and Meriden Cutlery Co., Manufacturers' prices net 10.00
Drawing Knives.
 Hart Mfg. Co. 10.00
 Adjustable Handle 10.00
Fry Pans.
 Tinned 10.00
 No. 1 10.00
 No. 2 10.00
 No. 3 10.00
 No. 4 10.00
 No. 5 10.00
 No. 6 10.00
 No. 7 10.00
 No. 8 10.00
 No. 9 10.00
 No. 10 10.00

Flice.
 Nicholson 10.00
 Diston 10.00
 Butcher 10.00
 Spencer 10.00
Fluting Machines.
 Eagle 10.00
 Crown 10.00
 Geneva 10.00
Hammer.
 Verkes & Plumb, new list 10.00
Hatchets.
 Verkes & Plumb, new list 10.00
Hinges.
 Strap and T 10.00
Horse Nails.
 Ausable 10.00
 Polished and 10.00
 Globe 10.00
 Clinton 10.00
 Porter, all sizes 10.00
 Discount on Ausable and Clinton, 20%; Globe, 10%

Locks and Knobs.
 Bradford 10.00
 Gaylord Cabinet 10.00
 American Padlocks 10.00
 Scandinavian Padlocks 10.00
 No. 1 10.00
 No. 2 10.00
 No. 3 10.00
 No. 4 10.00
 No. 5 10.00
 No. 6 10.00
 No. 7 10.00
 No. 8 10.00
 No. 9 10.00
 No. 10 10.00

Lanterns.
 Square Candle and Oil 10.00
 Tubular 10.00
 Globes, 35 cents extra per doz. net 10.00
Lawn Mowers.—Pennsylvania 10.00
 Philadelphia 10.00
 Excelsior 10.00
 Lawn and Garden Mowers 10.00
 Holland Patent 10.00
Mattocks.
 Long and Short Cutter 10.00
 Pennsylvania Pattern 10.00
Molasses Gates.
 Enterprise Mfg. Co.'s Measuring Faucets 10.00
 Stebbins Gates 10.00
 Lincoln's 10.00
 Landers, Frary & Clark's Petroleum 10.00
 Brass Liquor Cocks, new list \$1.10 10.00
 Cork Lined 10.00

Meat Cutters.—Pennsylvania Meat Cutter 10.00
 Rixson's 10.00
 Woodruff 10.00
 Stowe 10.00
 Hale's 10.00
 American 10.00
 Stuffers 10.00
Planes.—Ohio Tool Co. 10.00
 Scitoto 10.00
 Auburn 10.00
 New York Tool Co. 10.00
Plane Irons.—Ohio Tool Co. 10.00
 Butcher's 10.00
Plumb and Levels.
 Stanley's Adjustable 10.00
 Non-Adjustable 10.00

Picks.—New List 10.00
 Pumps—Blackford 10.00
 Riley's 10.00
 Stanley Ivory 10.00
Streetlights.—Hart's Pattern 10.00
 No. 1 10.00
 No. 2 10.00
 No. 3 10.00
 No. 4 10.00
 No. 5 10.00
 No. 6 10.00
 No. 7 10.00
 No. 8 10.00
 No. 9 10.00
 No. 10 10.00

Squares.
 Steel and Iron 10.00
 Try Squares, Stanley's 10.00
 Diston's Try Squares 10.00
 Scythies—Golden Circle, Damascus Blade, Boxed and Sharpened 10.00
 Clipper No. 10, Broussard Blade, Boxed and Sharpened 10.00
 Clipper No. 5, Painted Red, Boxed and Sharpened 10.00
Saws.—Disston's Hand and Rip 10.00
 Disston's Circular 10.00
 Cross-Cut No. 1, Plain Tooth 10.00
 Patent Tooth 10.00
 Boynton's Lightning Cross Cut, new list 10.00
 One Man, all lengths 10.00
 Billet Web, 30 inch 10.00
 Lightning Saw, cross bar 10.00
 Hand, Panel and Rip 10.00

Shovels and Spades.
 Bowland 10.00
 Oliver Ames & Sons New List 10.00
 Sed Irons—4 to 10 lbs. 10.00
 Mrs. Pett's Patent 10.00
 Stone—Arkansas Oil Stone 10.00
 Washita Extra 10.00
 No. 1 10.00
 No. 2 10.00
 No. 3 10.00
 No. 4 10.00
 No. 5 10.00
 No. 6 10.00
 No. 7 10.00
 No. 8 10.00
 No. 9 10.00
 No. 10 10.00

Screws.
 Flat Head Iron 10.00
 Round Head Iron 10.00
 Round Head Steel 10.00
Spoons.
 Fluted 10.00
 German Silver 10.00

Britannia, Boardman's 10.00
 Parker's 10.00
 Tinned 10.00
Springs.—Torrey 10.00
 Philadelphia 10.00
 Chaffield No. 1, \$2.75; 2, \$2.25; 3, \$2.00; 4, \$1.75; 5, \$1.50; 6, \$1.25; 7, \$1.00; 8, \$0.75; 9, \$0.50; 10, \$0.25
 Gem Coil No. 1, Large Jap'd 10.00
 No. 2, Medium Jap'd 10.00
 No. 3, Small Jap'd 10.00

Stocks and Dies.
 Stove Polish—Gem 10.00
 Onyx 10.00
Tacks, Brads, &c.
 Double Pointed Tacks 10.00
Traps.
 Genuine Oneds—Newhouse 10.00
 Oneds—Newhouse list 10.00
 Vices—Solid Box, Trenton new list 10.00
Wrenches.—Agricultural 10.00
 Coss' Genuine 10.00
 Mall, Bay 10.00
 Philada. Tool Co., Duplex 10.00

Wire.
 Bright or Ann'd, No. 10 to 18 10.00
 No. 19 to 26 10.00
 No. 27 to 36 10.00
 Coppered, 0 to 18 10.00
 Tinned Broom Wire 10.00
 Galvanized, No. 7 to 18 10.00
Wringers.
 Feathers No. 2 10.00
 Universal, No. 26 10.00
 Novelty, No. 10 10.00

PITTSBURGH.

Merchant Iron.
 Terms.—Note or acceptance at 60 days, with current rate of exchange on New York, or subject to 10 days from date of invoice.

Flat Bar.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Round and Square.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Oval Iron.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Half Oval and Half Round.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Horse Shoe.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Wagon Box Iron.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Heavy Bands.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Light Bands.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Hoop Iron.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
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 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

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 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Tank Iron.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
 1 1/2 to 4 by 1/32 to 1/16 inch 10.00

Sheet Iron.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
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 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
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 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
 1 1/2 to 4 by 1/8 to 3/16 inch 10.00
 1 1/2 to 4 by 1/16 to 1/8 inch 10.00
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Angle Iron.
 1 1/2 to 4 by 3/4 to 1 inch 10.00
 1 1/2 to 4 by 1/2 to 3/4 inch 10.00
 1 1/2 to 4 by 3/8 to 1/2 inch 10.00
 1 1/2 to 4 by 1/4 to 3/8 inch 10.00
 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
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 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
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 1 1/2 to 4 by 3/16 to 1/4 inch 10.00
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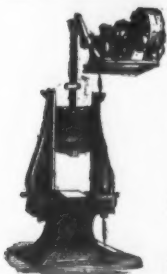
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 1 to 4 1/4 by 1 1/2 inch 10.00
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 1 to 4 1/4 by 2 inch 10.00
 1 to 4 1/4 by 2 1/4 inch 10.00
 1 to 4 1/4 by 2 1/2 inch 10.00
 1 to 4 1/4 by 2 3/4 inch 10.00
 1 to 4 1/4 by 3 inch 10.00
 1 to 4 1/4 by 3 1/4 inch 10.00
 1 to 4 1/4 by 3 1/2 inch 10.00
 1 to 4 1/4 by 3 3/4 inch 10.00
 1 to 4 1/4 by 4 inch 10.00
 1 to 4 1/4 by 4 1/4 inch 10.00
 1 to 4 1/4 by 4 1/2 inch 10.00
 1 to 4 1/4 by 4 3/4 inch 10.00
 1 to 4 1/4 by 5 inch 10.00
 1 to 4 1/4 by 5 1/4 inch 10.00
 1 to 4 1/4 by 5 1/2 inch 10.00
 1 to 4 1/4 by 5 3/4 inch 10.00
 1 to 4 1/4 by 6 inch 10.00
 1 to 4 1/4 by 6 1/4 inch 10.00
 1 to 4 1/4 by 6 1/2 inch 10.00
 1 to 4 1/4 by 6 3/4 inch 10.00
 1 to 4 1/4 by 7 inch 10.00
 1 to 4 1/4 by 7 1/4 inch 10.00
 1 to 4 1/4 by 7 1/2 inch 10.00
 1 to 4 1/4 by 7 3/4 inch 10.00
 1 to 4 1/4 by 8 inch 10.00
 1 to 4 1/4 by 8 1/4 inch 10.00
 1 to 4 1/4 by 8 1/2 inch 10.00
 1 to 4 1/4 by 8 3/4 inch 10.00
 1 to 4 1/4 by 9 inch 10.00
 1 to 4 1/4 by 9 1/4 inch 10.00
 1 to 4 1/4 by 9 1/2 inch 10.00
 1 to 4 1/4 by 9 3/4 inch 10.00
 1 to 4 1/4 by 10 inch 10.00
 1 to 4 1/4 by 10 1/4 inch 10.00
 1 to 4 1/4 by 10 1/2 inch 10.00
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 1 to 4 1/4 by 11 inch 10.00
 1 to 4 1/4 by 11 1/4 inch 10.00
 1 to 4 1/4 by 11 1/2 inch 10.00
 1 to 4 1/4 by 11 3/4 inch 10.00
 1 to 4 1/4 by 12 inch 10.00
 1 to 4 1/4 by 12 1/4 inch 10.00
 1 to 4 1/4 by 12 1/2 inch 10.00
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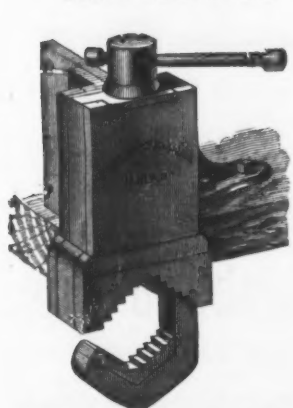
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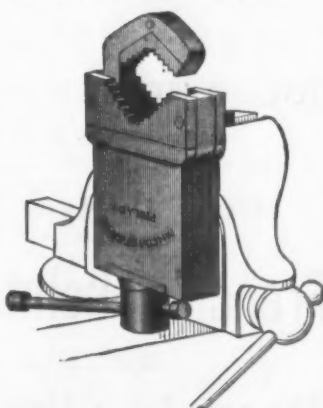
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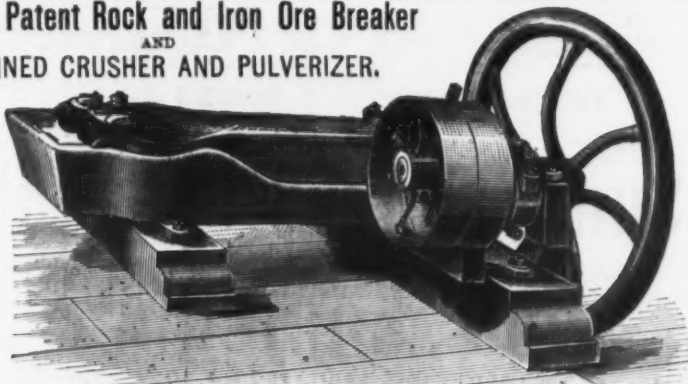
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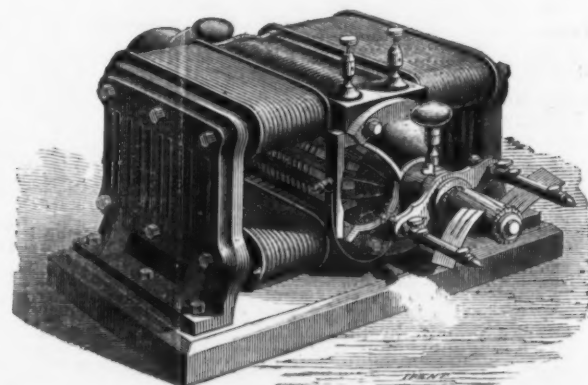
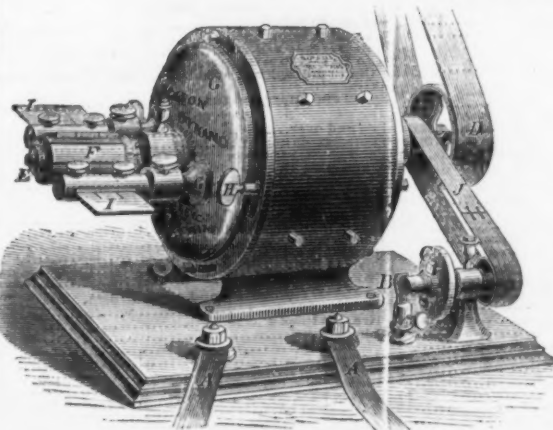
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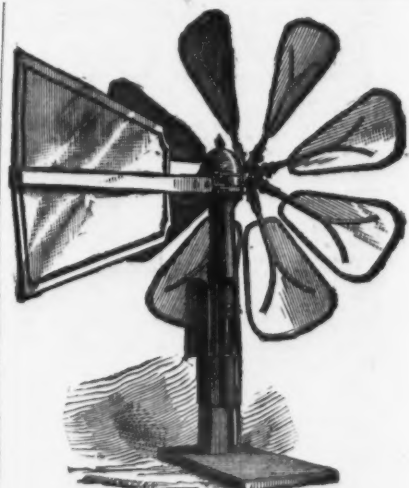
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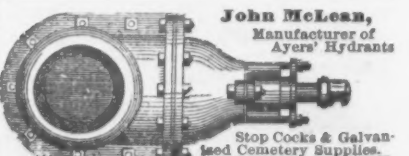
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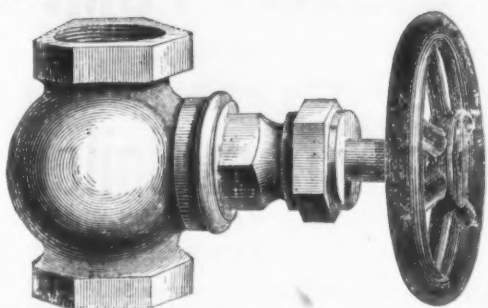
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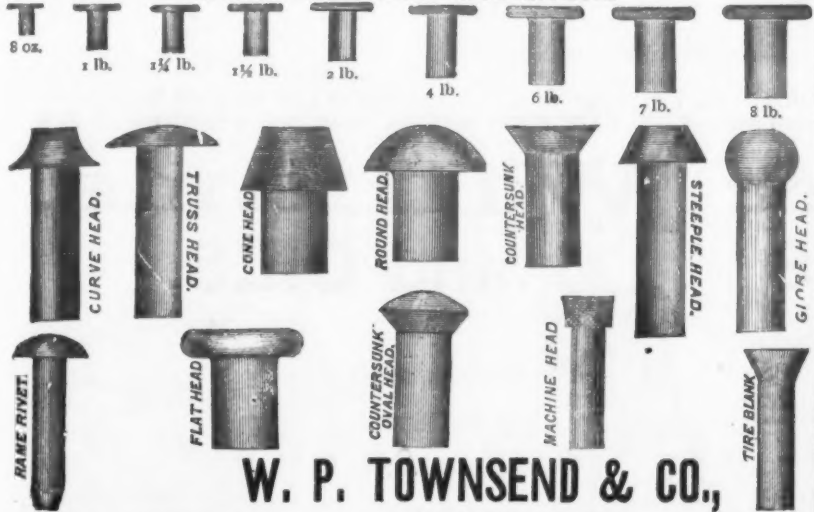
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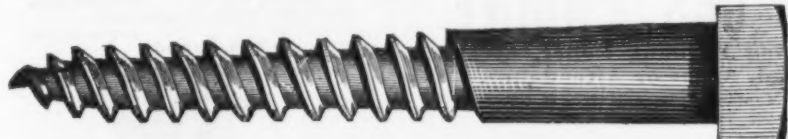


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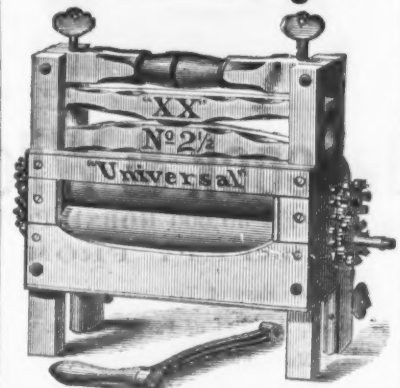
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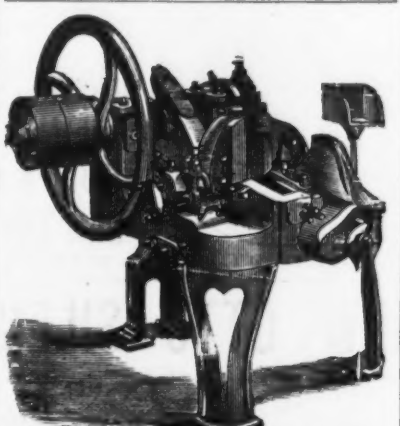
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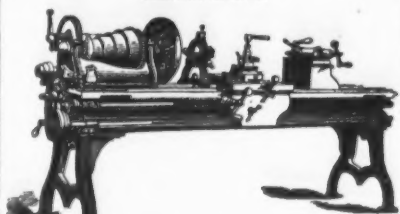
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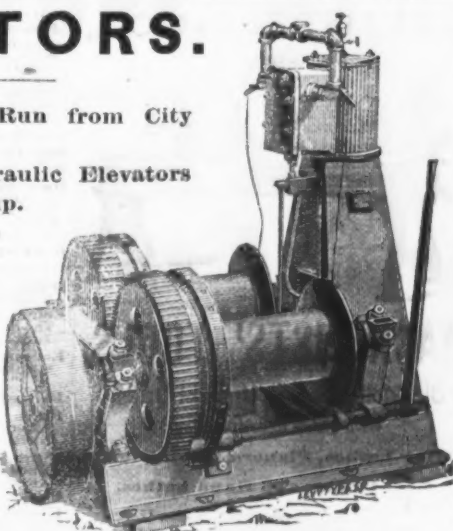
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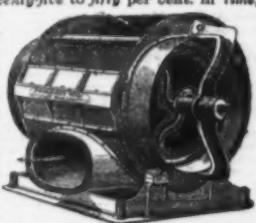
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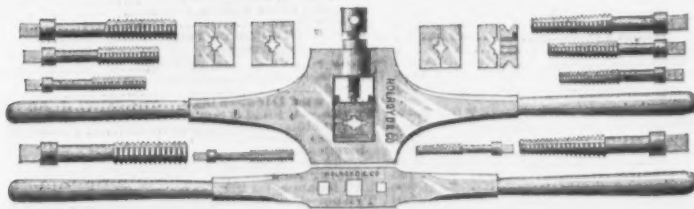
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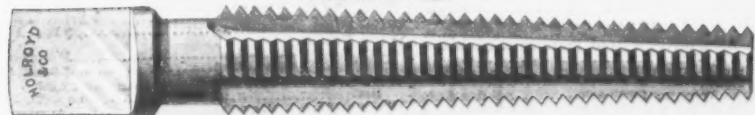


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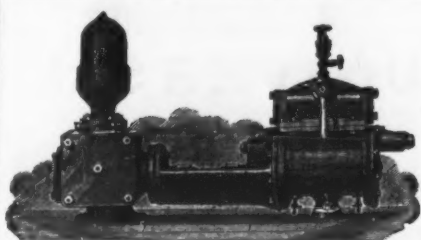
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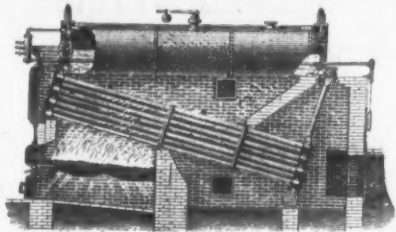
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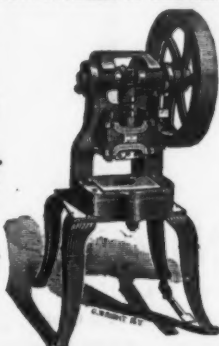
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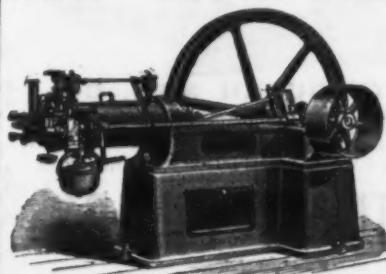


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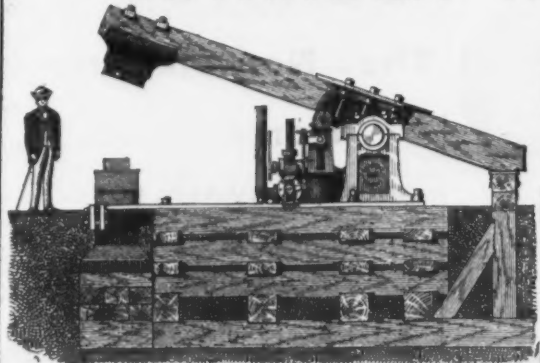
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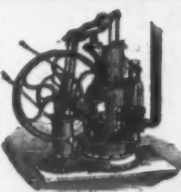
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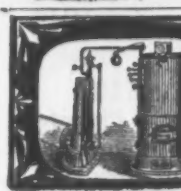


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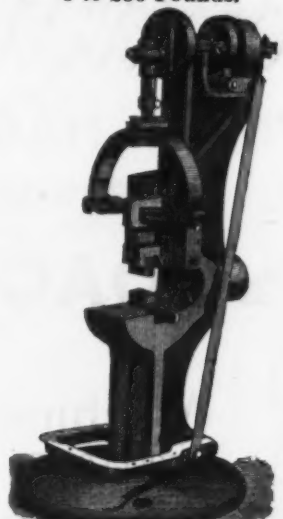
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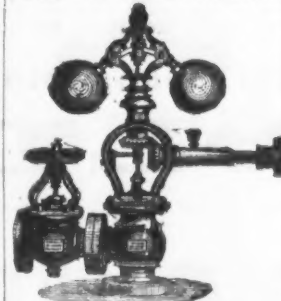
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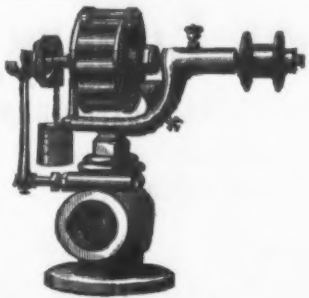
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4 1/2	30.00	35.00	3.00	9.00
5	35.00	41.00	3.50	11.00
5 1/2	40.00	46.00	3.75	13.00
6	45.00	52.00	4.00	14.00
6 1/2	50.00	58.00	4.50	17.00
7	55.00	64.00	5.00	21.00
7 1/2	60.00	70.00	5.50	25.00
8	65.00	76.00	6.00	31.00
8 1/2	70.00	82.00	6.50	37.00
9	75.00	88.00	7.00	43.00
9 1/2	80.00	94.00	7.50	49.00
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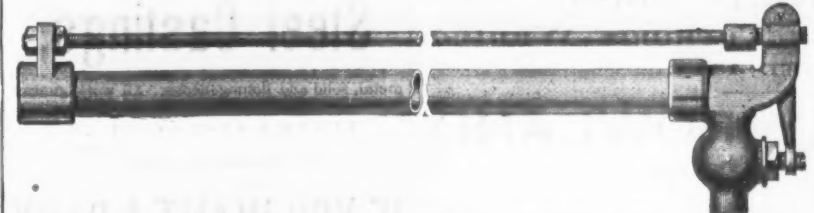
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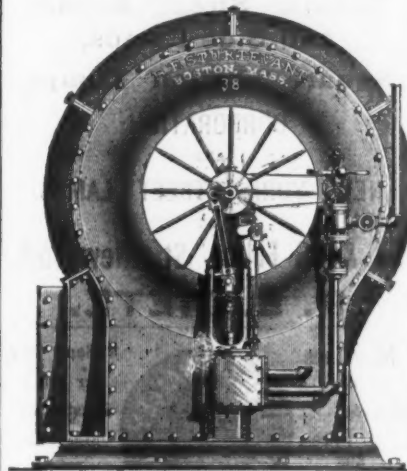
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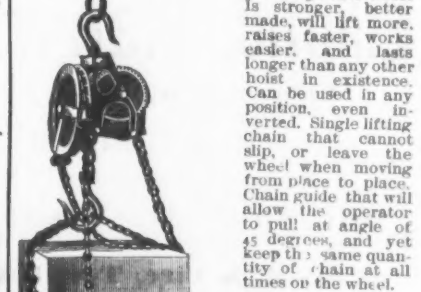
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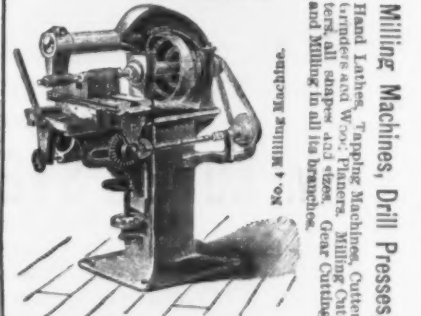
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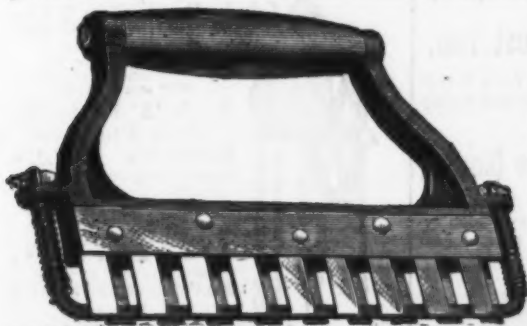
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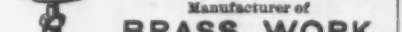
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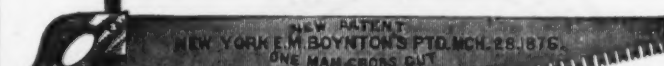
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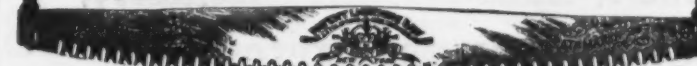


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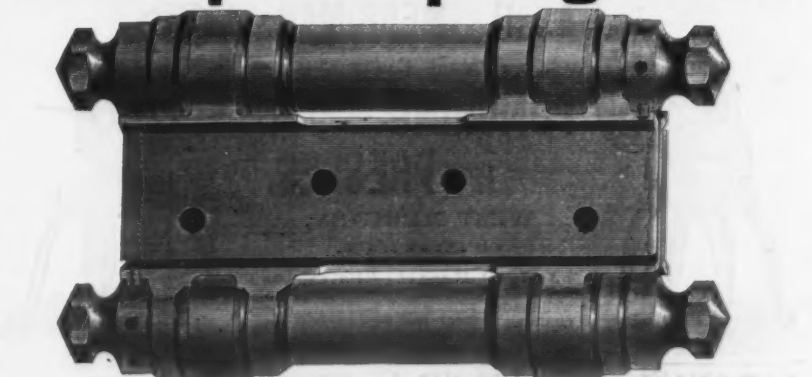


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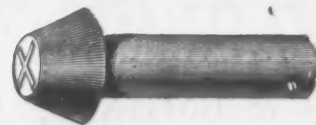
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